The Electrical Industry's Weekly Magazine

May 19, 1958

Electrical World

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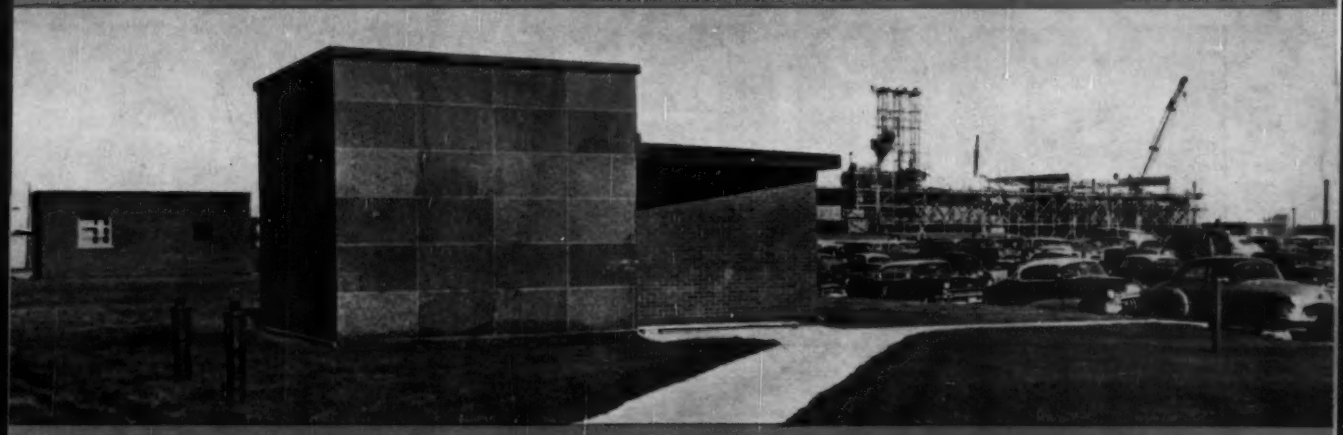
A McGraw-Hill Publication

3 Utilities Build New Substations



1. QUEBEC HYDRO buries 32,000-kva distribution station under attractive city park . . . p 73

2. WISCONSIN ELECTRIC POWER installs metalclad units in residential area . . . p 76

3. PUBLIC SERVICE OF INDIANA develops integrated-package suburban substation . p 78

"Best Appliance Values" Gets Tryout . . . p 66

E B POWER GS
UNIVERSITY MICROFILMS IN
313 N 1 ST
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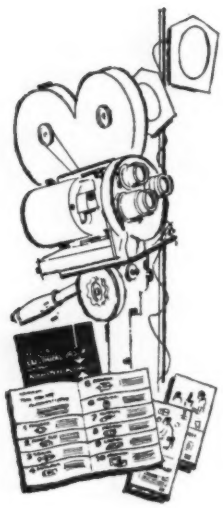
Announcing addition to continuing, market-development series...

NEW MPA PROGRAM



"Automating Electrically"—film package available now to help build load

MPA—More Power to America—now in its 14th year, is General Electric's continuing program of information and service to help speed industrial electrification. Newest addition to the MPA film series is "Automation and Mr. Halstead" which supplements G.E.'s earlier program, "This is Automation" released two years ago. It again demonstrates General Electric's pioneering leadership in market development activities which mutually benefit utilities and manufacturers.

Full-color motion picture and an authoritative 44-page manual entitled "The Impact of Electrical Progress on Your Automation Planning" are powerful new load-building tools. They are available for sale or loan to help power sales engineers dramatize these concepts to your industrial customers. Contact your local G-E Apparatus Sales Office for complete details or for a showing of the film. General Electric Company, Schenectady 5, New York. 301-381

Since 1945, 37 programs have been released of which 19 are in continuing, active demand as load-building tools

MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

Vol. 149, No. 20 MAY 19, 1958

Published for 84 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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CURRENT EVENTS

Meet GE's Paxton: Pilot of the Upturn Plan

What are the new president's views on price hikes, fair trade, and other timely topics? Exclusive interview.....p 70

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Kansas City meeting told improved core steel cuts transformer noise; bundled conductors boost 138-kv capacities..p 92

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Attractive Subs Have Lower-Cost LV Side

R. A. Switzer, Wisconsin Electric Power Co

Single-pole reclosers cut switchgear costs 50%. High capacity fuses protect reclosers from severe faults.....p 76

Factory-Packaged Station Feeds Suburb Load

J. M. Hedges, J. J. Trainor, Public Service Co of Indiana

HV fuses and arresters are mounted on tank. Steel frame supports LV disconnects, arresters, Pt's and reclosers.....p 78

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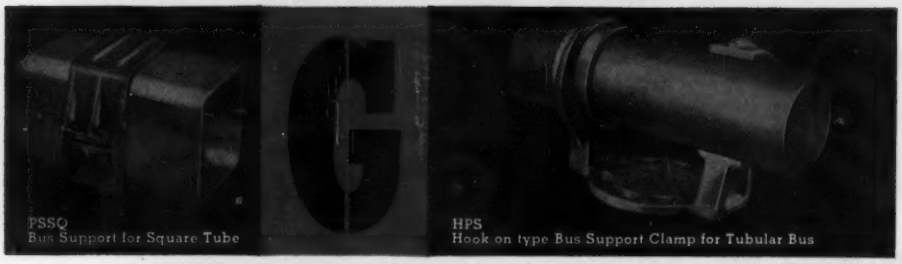
PLH
Ring Type Bus Support for Tubular Bus

SBC
Sliding Bus Support for Tubular Bus



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Bus Support Clamp for Cable

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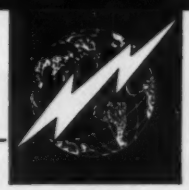
Let's Face It



The average residential customer is paying twice as much for electricity as he was in 1944. Of course, in these same thirteen years he has increased his use almost three times. Certainly he is paying less per kilowatt-hour by some 12%. But the fact of the matter is, the average customer spends much more for electricity than he did in 1944.

This approach to the subject may startle some people who hang on to the idea that the average cost per kilowatt-hour is really significant. Frankly, I doubt if this approach will be useful for many more years and therefore suggest that a few new ideas be investigated in this very important area.

In the first place, customers are getting much better values. Electric service is more dependable than ever before. For an increase in annual cost of $40 per year or $3.33 per month, the average customer has the use of television, room coolers, dishwashers, dryers, freezers, and a host of small appliances.

In the future, such loads as house heating will add very large increments to the monthly bill. A low rate per kilowatt hour will not impress the customer. He will have to be sold on the value of the total charge.

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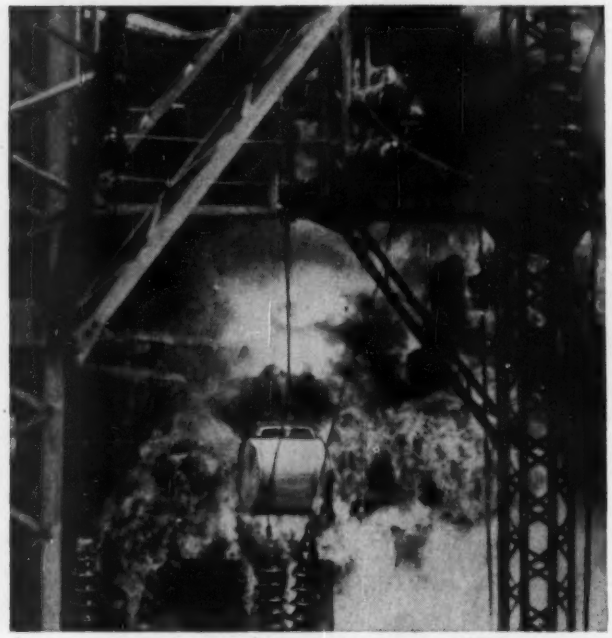
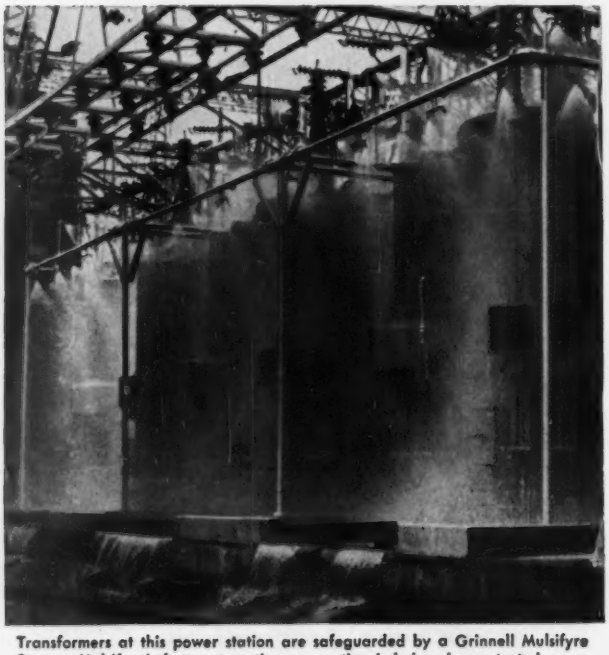
Transformer Fires!



Transformer fire at this power station caused an estimated $50,000 damage. There was no special fire protection system on guard.



Transformers at this power station are safeguarded by a Grinnell Mulsifyre System. Mulsifyre's fast, automatic spray action is being demonstrated.

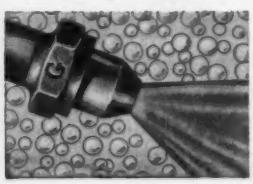
When fire occurs, you can depend on GRINNELL MULSIFYRE to extinguish it... fast

A Grinnell Mulsifyre System is effective wherever the danger of fire in medium or heavy oils can be limited to a definite area. Grinnell Mulsifyre Spray Projectors usually have the fire *completely* out in a matter of seconds after the water discharge starts.

Three recent transformer fires which prove the ability of Grinnell Mulsifyre to put out oil fires quickly.

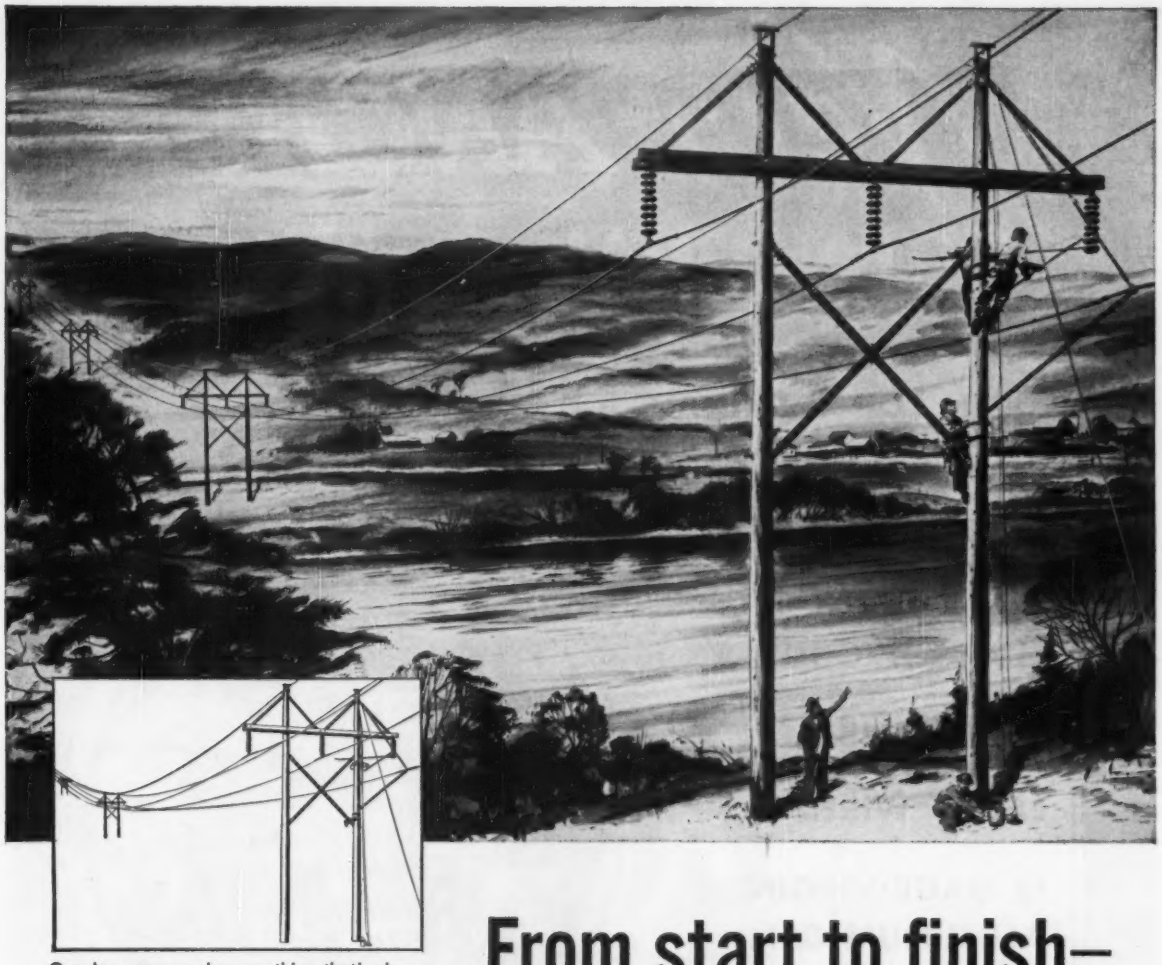
- Considerable oil was spilled when there was a failure in a 100,000 KVA transformer. The flash fire which resulted was immediately extinguished by the automatic operation of a Grinnell Mulsifyre System. This fire, if not checked, could have destroyed transformer, an adjacent transformer of equal capacity, and associated bus structure.
- In another utility fire, the cause originated with a faulty H. T. bushing on a 50,000 KVA transformer. A break in the bushing sprayed burning oil over the surrounding equipment. The heat-activated Mulsifyre System took only 20 to 30 seconds to extinguish fire on the bank.
- Bushing failure resulted in still another fire in a 150,000 KVA transformer. This transformer was protected by a manually controlled Mulsifyre System. Fire was rapidly extinguished upon manual operation of system except for blaze at the top of the bushing which was above the space protected by the Mulsifyre system. Fire damage to transformer was limited to fan blades and blistered paint on radiators.

For detailed information, write . . . Grinnell Company, Inc., 277 West Exchange Street, Providence, R. I. Branch offices in principal cities.



GRINNELL *Mulsifyre*

EMULSION EXTINGUISHMENT OF OIL FIRES



Graybar can supply everything that's shown above — except linemen and scenery — for line construction and maintenance. Poles, crossarms, hardware, tools—a partial list of items that are stocked at strategic Graybar locations throughout the country. All available for fast delivery to you. It pays to call Graybar . . . *first.*

From start to finish—
arrange for continuing supplies and equipment—with Graybar

Engineers deep in the problems of new transmission *line construction* must be able to depend upon reliable, on-time deliveries to keep their schedules. And later, to meet the continuing task of *line maintenance*, the selection, dependable delivery and warehousing of supplies and equipment are vital.

Graybar backs up design and construction engineers to speed up these processes. Through more than 130 offices and warehouses, Graybar supplies prompt catalog information on everything electrical needed in line construction and maintenance.

To speed up the selection and delivery of anything and everything you need for line construction and maintenance call Graybar first. *Graybar Electric Company, 420 Lexington Avenue, New York 17, N. Y.*

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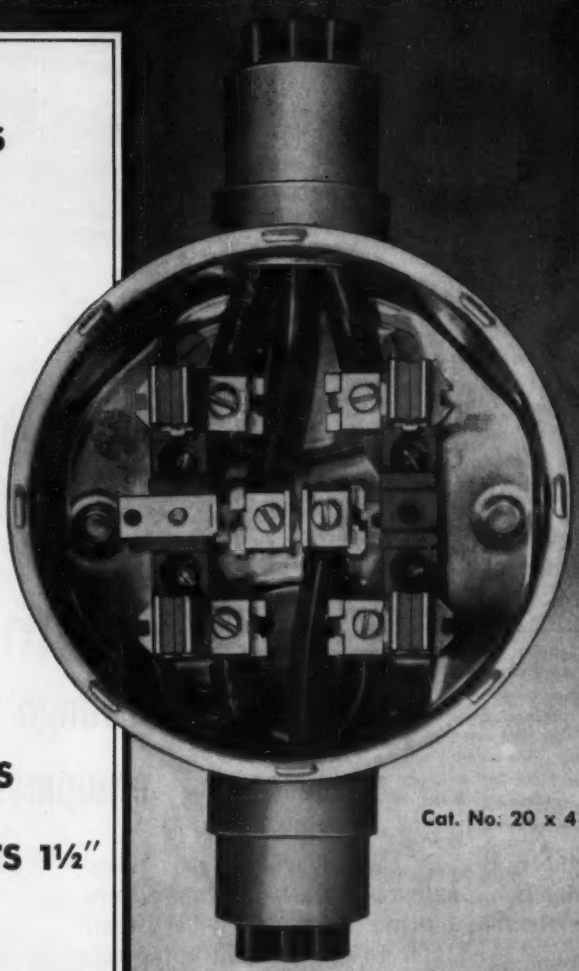

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Send for Bulletin No. 58-A

ANCHOR MANUFACTURING CO.
MANCHESTER, NEW HAMPSHIRE

SOUTHWIRE now offers aluminum conductor with

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This superior product is the result of three years of development by our Research and Development Department, and the recent installation of entirely new melting furnaces — finest in the industry.

Southwire has *always* produced aluminum conductor with an average conductivity exceeding 61% IACS. And we are happy to announce that 62% conductivity conductor is available on request, plus increases in tensile strength, ductility, smoothness and long redraw rod lengths, enabling us to eliminate welds — superior qualities equally important to the electric industry.

When you specify Southwire 62% aluminum conductor, you not only get the finest products possible, but service on a par with it.

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And Get Four Other Equally Important Characteristics.

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- U.R.C. (DBWP, TBWP) Copper
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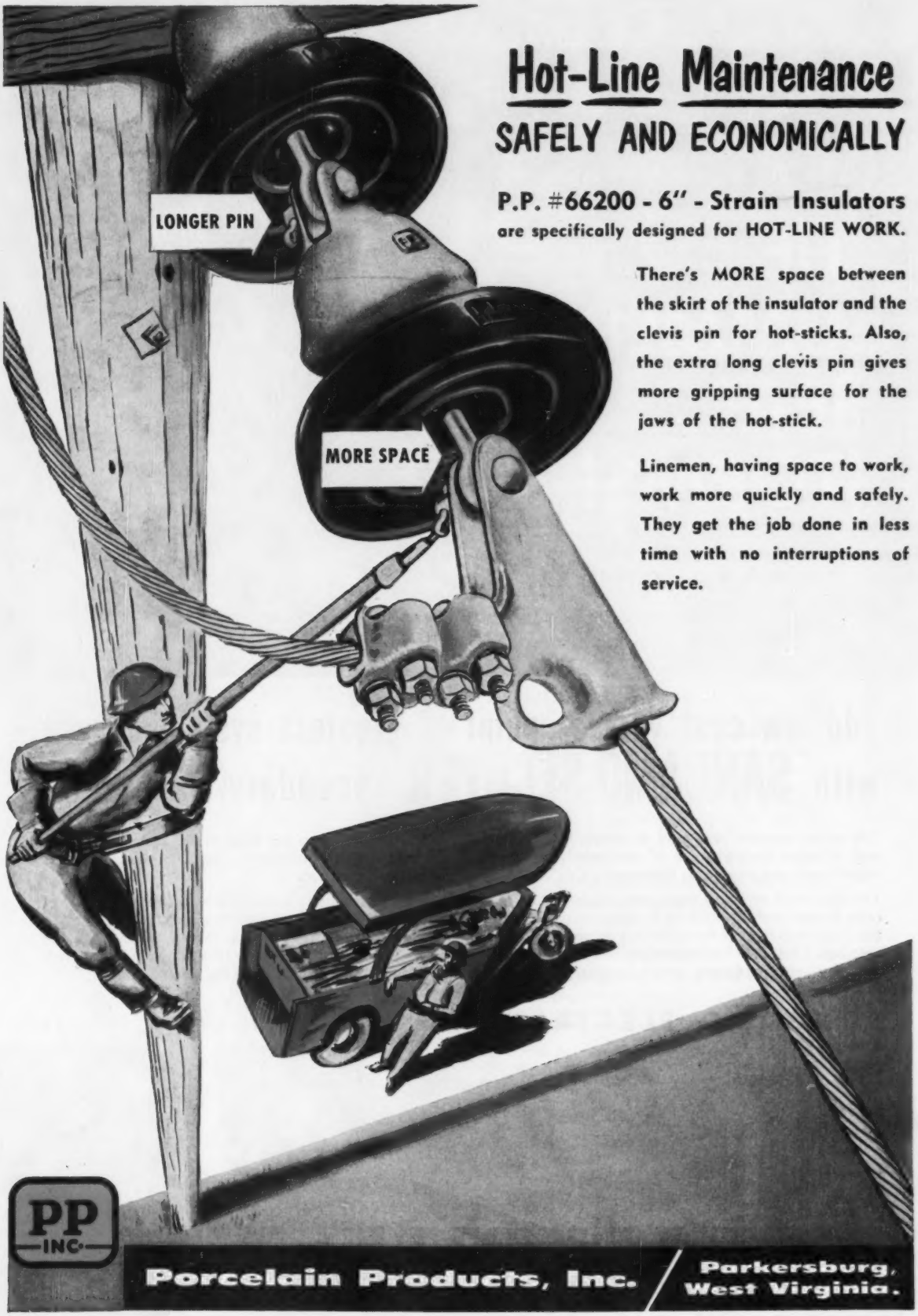
With Dowell Service you receive the benefits of more than fifteen years experience in chemical cleaning—plus special equipment, chemicals, research and trained personnel. You pay one charge, get an efficient job, handled by knowledgeable people.

Every industry can profit from Dowell Service. Ask your maintenance and operating engineers if they have thoroughly investigated the profit possibilities of using Dowell Service. DOWELL INCORPORATED—A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY. Headquarters and research center, Tulsa, Oklahoma; 165 offices and stations to serve you.

Chemical cleaning service for industry DOWELL



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SAFELY AND ECONOMICALLY

P.P. #66200 - 6" - Strain Insulators
are specifically designed for HOT-LINE WORK.

There's MORE space between the skirt of the insulator and the clevis pin for hot-sticks. Also, the extra long clevis pin gives more gripping surface for the jaws of the hot-stick.

Linemen, having space to work, work more quickly and safely. They get the job done in less time with no interruptions of service.

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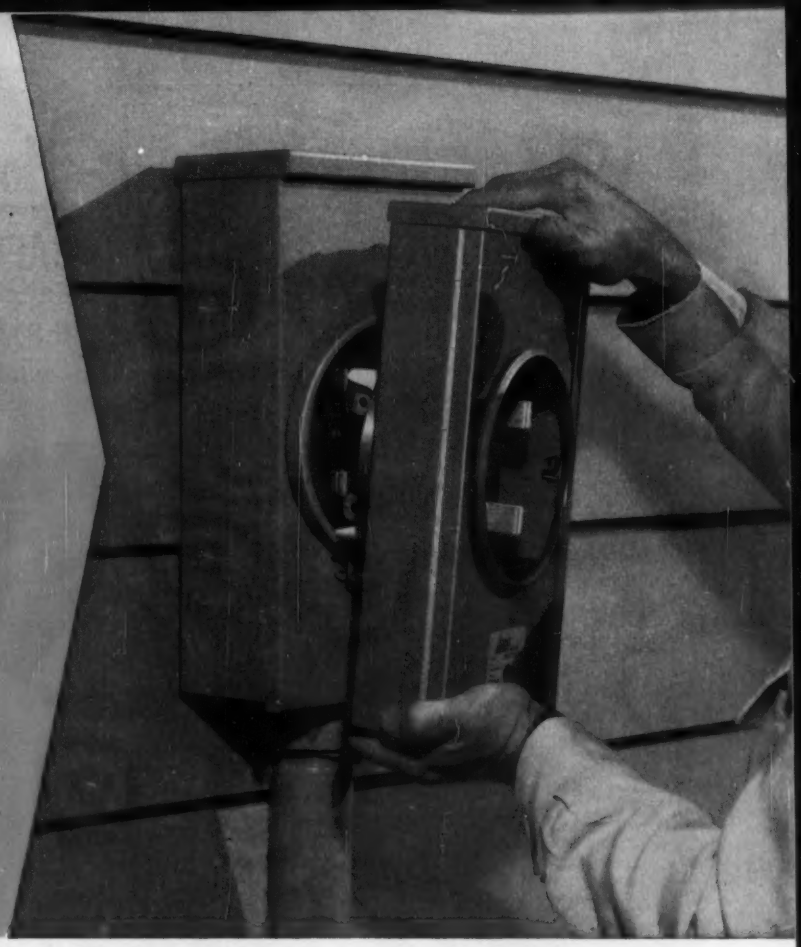
BEAT THE SUMMER HEAT STORMS!



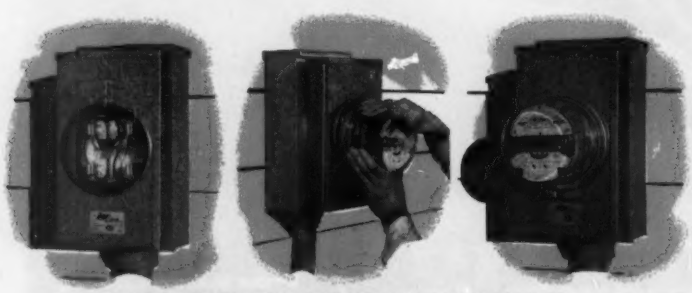
add low cost vars at point of greatest system benefit with SANGAMO SECOVAR Secondary Capacitors

The critical summer peak load is coming up fast! And with it comes the nightmare of overloaded distribution transformers and emergency changeouts.

You can avoid replacing overloaded equipment in most cases by permanently installing Sangamo Secovar Secondary Capacitors right at the meter box on your customer's premises. These 240 volt capacitors can be installed by one man—give maximum system benefits all down the line . . . from the service drop to the secondaries . . . to the distribution transformer . . . to the power transformer . . . to the generator.

They provide a quick and easy solution to the problem of unloading hot distribution transformers. Secovar Capacitors are available in two types: Type S, a 2 kvar unit for socket mounting; and Type N, a 1 kvar unit for adjacent mounting. Bulletin 1131 gives full information.

SANGAMO ELECTRIC COMPANY, Springfield, Illinois



ONE MAN INSTALLATION

1. Plug Secovar unit into meter socket and install sealing ring.
2. Install watthour meter in Secovar socket.
3. Installation is complete —ready to supply vars to your system.

OPTIONAL THERMOSTATIC SWITCH

Automatically switches capacitor in and out on predetermined ambient temperatures. Standard range is on at 85° F.—off at 75° F.

PC58-4

OVER A MILLION CHANNEL MILES OF RCA MICROWAVE NOW IN SERVICE... RCA

Here's Your "Economy-Model" Microwave

New RCA MM-9E Equipment Specially Designed for Short-Haul Unattended Operation

If you do not require an elaborate microwave system, the MM-9E will provide you with quality equipment at a low price . . . ideal for short-haul systems utilizing up to 24 channels. Simplified circuits and low power drain make it highly adaptable to battery operation; or for portable use where temporary application is indicated. Conservative design and direct crystal control of transmitter and frequencies contribute to its suitability for unattended operation.

- **Can be pole mounted, for economy**
- **890-960 MC frequency band for optimum microwave propagation**
- **Modulation band width 140 KC. 24 channels FCC type accepted**
- **Low equipment voltage required— Maximum 130-150 volts**
- **Utilizes new pencil triodes for dependability**
- **No blowers**
- **Standby equipment available**

DESCRIPTION OF EQUIPMENT

High quality receiver, a single superheterodyne type using direct crystal-controlled local oscillator, is mounted on a single panel. Transmitter, a single-chassis unit, makes use of phase modulation, direct transmitter control of transmission frequency and simple cavity construction designed for reliable operation and ease of maintenance. Equipment can be provided either as a simple terminal or back-to-back repeater with or without standby.

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RCA Type MM-9E assemblies are furnished in a number of arrangements. The services of RCA Communications specialists are available to assist in determining specific requirements. For further information, use coupon.

LARGEST SINGLE-FURNACE STEAM GENERATOR

WILL DELIVER 2,310,

for Unit No. 4 at Union

New 300,000 kw generating unit will increase station capacity to 860,000 kw

WITH Unit No. 3 still in the final stages of construction, Union Electric Company has already contracted for the addition of Unit No. 4 to the fast-growing Meramec Station. This new generating unit, scheduled for completion in 1961, will be the largest on the Union Electric system, adding 300,000 kw and bringing Meramec Station's total capacity to 860,000 kw.

Steam for the new turbo-generator will be supplied by a Foster Wheeler reheat steam generator with a maximum continuous rating of 2,310,000 pounds per hour — the largest FW single-furnace unit ever built! Pressure at the superheater outlet will be 2200 psig and primary and reheat steam will have a final total temperature of 1010F/1010F, with a reheat steam flow of 1,790,000 lb/hr.

The unit is designed for balanced draft operation, firing pulverized coal. Three Foster Wheeler D-9 Ball Mill Pulverizers will prepare fuel for the 18 FW Intervane Burners.

The new 2,310,000 lb/hr steam generator will take its place beside another FW unit — the 1,850,000 lb/hr twin furnace, dual circulation reheat steam generator for 275,000 kw Unit No. 3 at Meramec Station.

The proved dependability and long-range economy of Foster Wheeler steam generators are backed by more than 50 years of experience in pioneering power plant equipment. We will be pleased to quote on your requirements.

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FEEDWATER HEATERS • HEAT EXCHANGERS • ECONOMIZERS
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FOSTER

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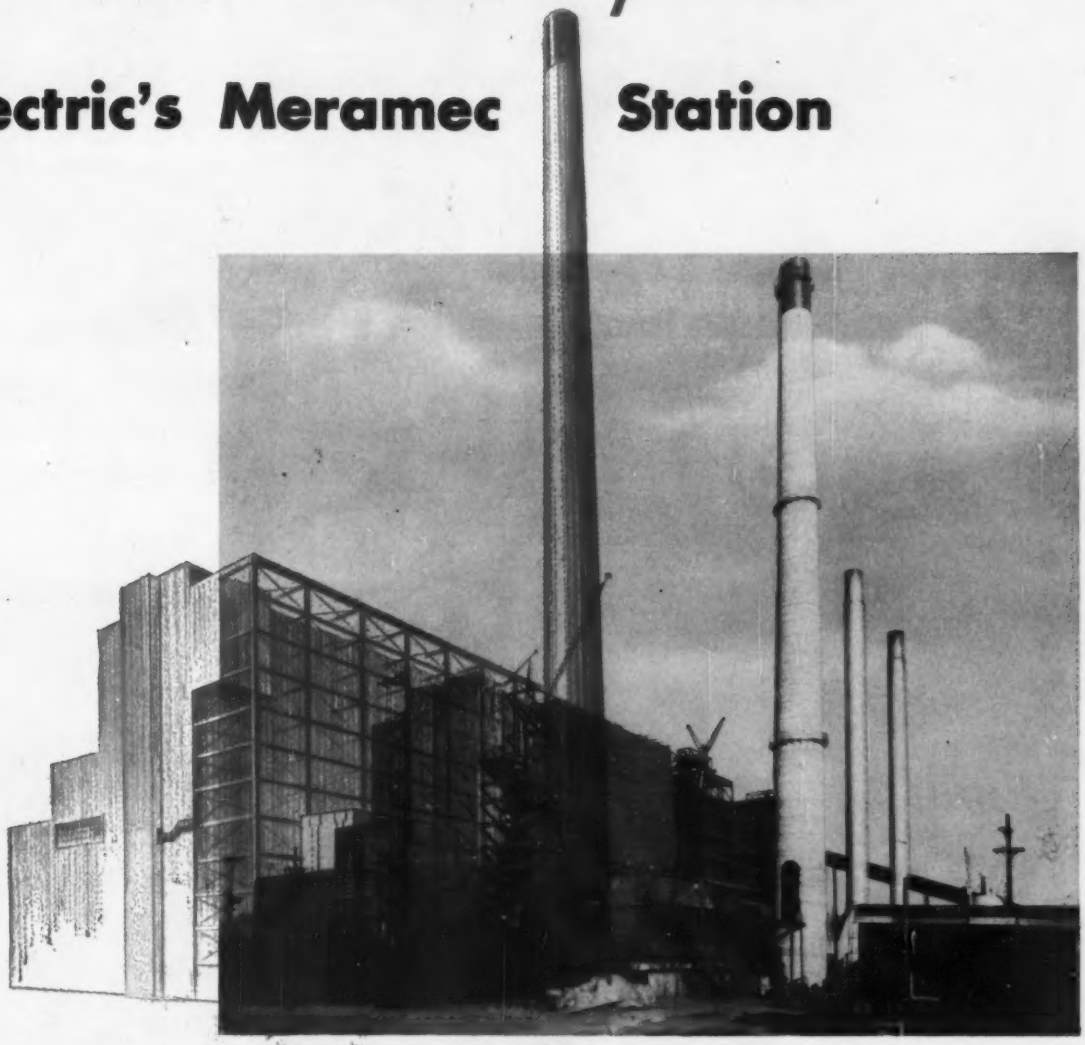
000 lb/hr

Electric's Meramec Station



The photo above shows Union Electric's Meramec Station, with Unit No. 3 under construction. This 275,000 kw unit, supplied by a Foster Wheeler twin furnace, dual circulation reheat steam generator of 1,850,000 lb/hr capacity, is scheduled to go on the line this summer. The artist's sketch, in color, shows the location of 300,000 kw Unit No. 4, which, when completed in 1961, will bring total station capacity to 860,000 kw. The new unit will be served by the largest single-furnace steam generator ever built by Foster Wheeler — with a maximum continuous rating of 2,310,000 lb/hr, 2200 psig, 1010F/1010F.

WHEELER

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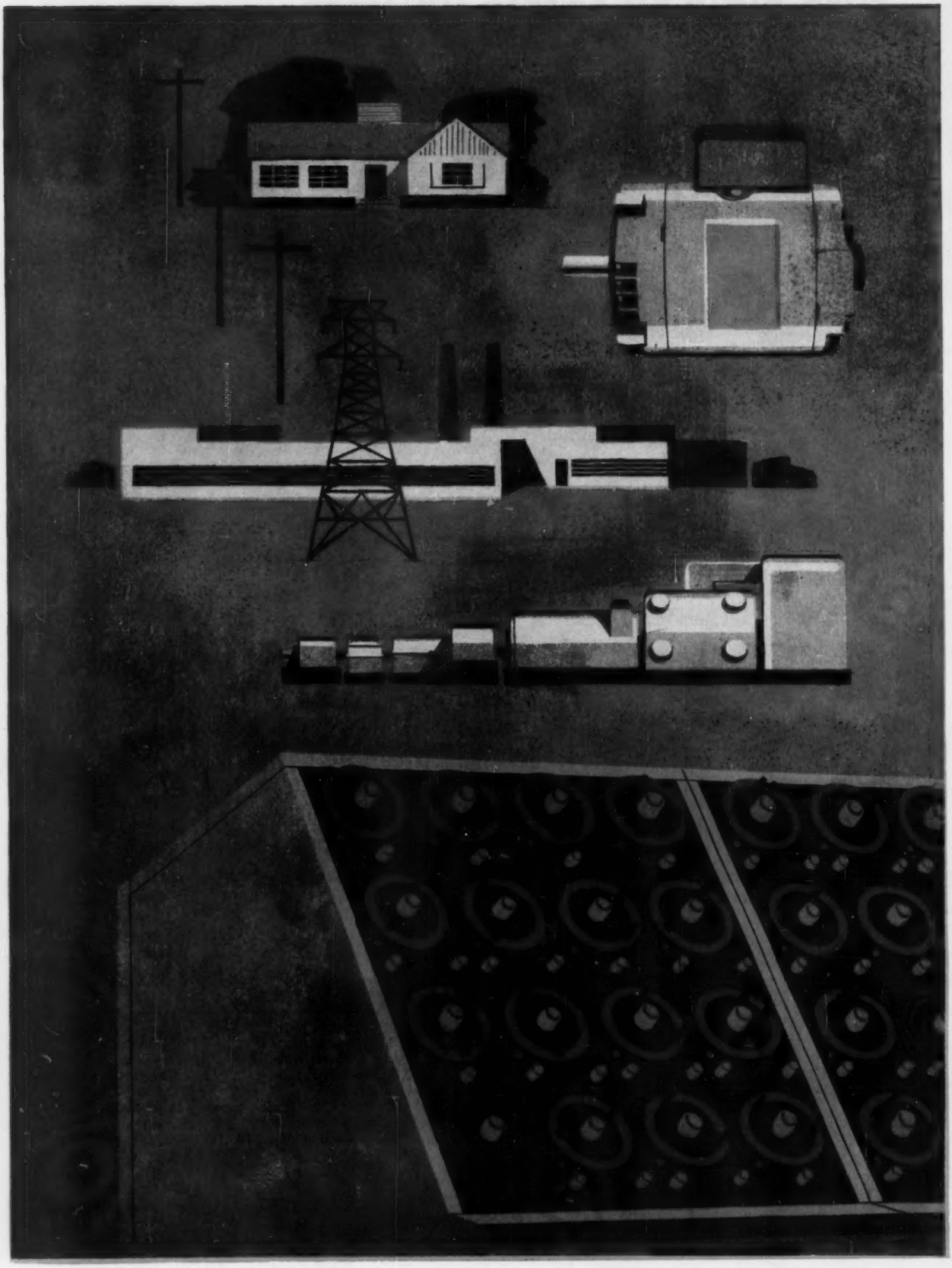

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Improves operation of your system • Reduces your generating costs

Building upon proven control techniques, Westinghouse has developed *new concepts* to make automatic power system control practical for *any size* utility. This new equipment has many unique features with unusual flexibility and is designed to meet the exact requirements of your system.

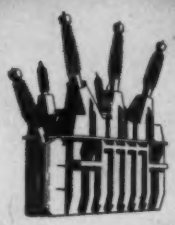
Savings with Westinghouse Automatic Dispatching System will quickly pay for this investment . . . with simplified dispatching to meet daily load schedules, automatically computing transmission losses and accurately maintaining tie-line pool operations.

A Westinghouse Automatic Dispatching System brings you *modern* control for: improved economies, better intercompany relations, improved service and optimum use of tie-lines. Equipment continuously regulates generation to match system requirement, maintaining all machines in economic dispatch.

For information that can lead to more economical operation of your system, ask your Westinghouse sales engineer about the new Westinghouse Automatic Dispatching System. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. Ask for Folder B-7580. J-60960

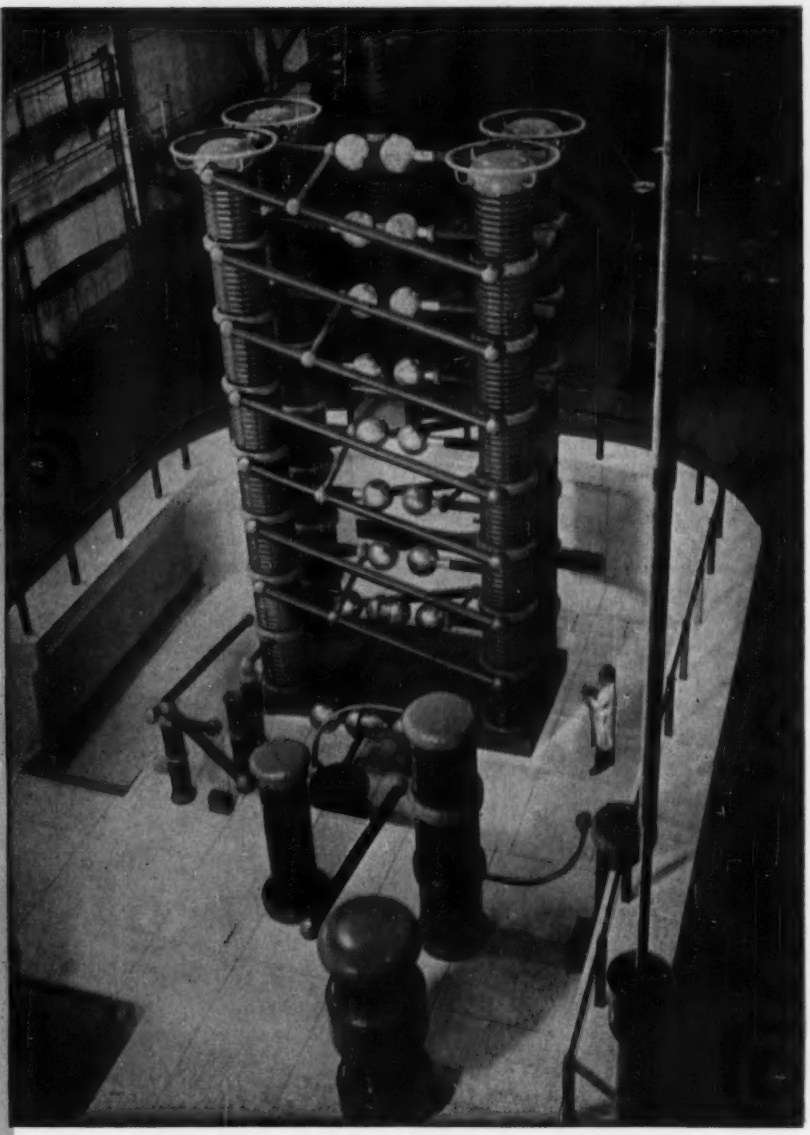
YOU CAN BE SURE...IF IT'S Westinghouse

POWER CONTROL SYSTEMS



Transformer Capacity of over 5,000,000 kVA per annum

The Ferranti transformer plant at Hollinwood, Lancashire, England, covering an area of over 300,000 sq. ft., has a manufacturing capacity per annum of over 5,000,000 kVA of Large Power Transformers, Distribution Transformers, Voltage Regulators, High Voltage A.C., D.C., and Impulse Testing Plant and Specialised Equipment. Contracts include the supply of transformers for the Garrison Dam and McNary Dam Projects in the U.S.A. and the Alcan Project in Canada.



National Physical Laboratory

This Ferranti Impulse Generator at the National Physical Laboratory, Teddington, England, by whose permission the photograph is reproduced, generates 3,200,000 volts and has an energy rating of 77 kW seconds. This is a typical example of the type of A.C. and D.C. equipment manufactured by Ferranti Ltd., for routine and research testing.

FERRANTI LTD *Head Office and Plant:* HOLLINWOOD · LANCASHIRE · ENGLAND

OFFICES AND PLANTS FT 160

NEW YORK: Ferranti Electric Inc., 30 Rockefeller Plaza, N.Y. 20
TORONTO: Ferranti Electric Ltd., Mount Dennis, Toronto 15, Ontario
MANCHESTER, ENGLAND: Ferranti Ltd., Moston, Manchester 10
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The Electrical Newsletter

FUTURE NEWS ▶ **Recent strength in electric utility common stocks** may indicate a continued rise until the average yield will go down to around 4%. Moody's average now shows a 4.40% yield.

LATE NEWS ▶ **Tornado hits West Texas Utilities, causing worst power failure** in WTU's history. About 50 towns were blacked out.

U. S.'s first annual all-electric home heating rate goes into effect June 10 on Pennsylvania Electric lines, pending PUC okay. First 6,000 kwhr will cost 2.2¢; all over that, 1.6¢. Minimum yearly rate will be $132 for 6,000 kwhr. . . On July 7, Metropolitan Ed will install monthly rate of $3.80 for first 100 kwhr; 1.6¢ over that.

Soviets start constructing 800-kv dc line from Stalingrad to Donbass, 310 mi away. Substations to transfer ac and dc are underway.

A new line of high-voltage air-blast circuit breakers was unveiled by GE at recent Pennsylvania Electric Assn meeting. Line uses a single-interrupter design as a building block for a family of ratings from 10,000 Mva at 115 kv to 33,000 Mva at 460 kv.

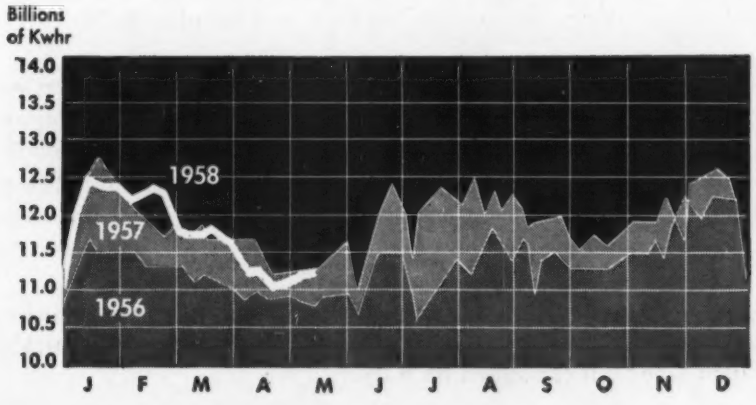
Plan to build 1-million kw of nuclear power capacity in Europe in next five years is agreed upon by U.S. and six-nation Euratom.

A crimp in Live Better Electrically and Housepower program is in the offing if proposed revisions to Chicago's electrical code go through. The revisions could result in reducing panelboard sizes.

Jersey Central P&L is negotiating for purchase of Tri-County Rural Electric Co, Inc, which has 2,500 meters.

Management changes . . . Dayton P&L makes VP Kenneth Oxley associate general manager . . . Southern Nevada Power ups E. F. Johnson to VP.

POWER OUTPUT—No Change (Week ending May 10), Kwhr 11,315,000,000



Per Cent Change From Previous Year

	Apr. 26	May 3	May 10
Total U.S.	−0.9	−0.3	−0.0
New Eng.	+1.8	+3.0	+2.9
Mid. Atlantic ..	+0.1	+0.7	+1.6
Cent. Ind.	−4.0	−3.2	−2.9
West Cent.	+2.7	+2.5	+0.4
Southeast	−0.5	−0.8	−0.3
South Cent. ...	+0.5	+6.3	+6.6
Rocky Mount...	+2.1	+2.1	+5.9
Pacific			
NW	−5.9	−6.6	−8.2
SW	+3.3	+2.3	+3.1

Seasonally Adjusted Index 226.8
Week Ago 226.3 Year Ago 226.3

Atomic Energy Commission requirements—1,050,000,000 Kwhr (Electrical World Estimate). Excluding AEC, Output increase was 1.0%.

A TWO-MINUTE PREVIEW OF THIS ISSUE

EVENTS ▶ **Electric utilities, in their '58 capital spending programs, have** skimmed a mere 2.1% from their late 1957 estimates. This is revealed in the latest EW survey of 85 of the nation's utilities (p 68).

Pres Paxton tells how Operation Upturn can help remedy the ailing economy in EW's exclusive interview with the new GE president. What are the prospects for an improvement in general business conditions, and how can electric utilities help themselves and the economy by tying in with the new GE program? See p 70.

To recapture elusive appliance sales, Appleton, Wisc., launches a "Better Buy Now" program which may turn out to be the forerunner of a national drive (p 66).

SUBSTATIONS ▶ **Are you troubled by a shortage of above-ground space for substations** in metropolitan areas? Your answer may be to go underground, as Quebec-Hydro has done in Montreal. Located beneath an attractive city park, the utility's new 32,000-kva, 14-feeder distribution center serves residential and small commercial loads. This type of station, unattended and supervisory controlled, could also be built in the basement of an apartment or office building (p 73).

That rare combination of beauty and economy has been incorporated in five new substations now operating in Wisconsin Electric Power's suburbs. The metal-clad units, using single-pole reclosers on outgoing feeders and including conventional transformer and high-voltage equipment, have achieved two goals. First, they have reduced investment costs by over 50%. Second, they've won community approval of the utility for its good neighbor policy (p 76).

A new "factory-package" unit, composed of transformer and switching substation, has been designed to serve suburban and rural areas. The economical and readily available substation, brainchild of Public Service of Indiana and Moloney Electric, has a 3,750-kva, 3-phase LTC transformer equipped with high-voltage lightning arresters and fuses mounted on top of the tank. Other features of the new unit include reduced design and installation time, and mobility (p 78).

DISTRIBUTION ▶ **A versatile 100-kva transformer trailer is solving problems** in distribution for Consumers Power. Aside from its original purpose of temporarily replacing transformers removed for shop inspection, the single-phase unit has picked up other jobs. They range from pole-top inspection of out-of-service transformers to providing short-term service to carnivals and other customers (p 80).

Rope cradles are the answer to greater line stringing safety to pedestrians, advises Appalachian Power. Their inexpensive and quickly installed scheme is explained on p 85.

The swing to aluminum continues. For economy reasons, Ohio Power and Indiana & Michigan Electric are by-passing copper to install all-aluminum 3-conductor service entrance cables in homes . . . And in Hawaii, aluminum distribution-line hardware is now undergoing severe marine-corrosion tests by Hawaiian Electric, in co-operation with a big aluminum manufacturer (p 72).

GENERATION ▶ **Want to chalk up substantial savings** in grinding large commutators? By using a lathe and portable rotor-turner, as Ohio Power has done, you can cut costs in both dollars and man-hours (p 85).

MANAGEMENT ▶ **April's housing upturn is just the beginning** of a strong trend that will last into 1959, predicts the McGraw-Hill Dept of Economics. Sparked by the new federal housing bill, April private housing starts rose to a seasonally-adjusted annual rate of 950,000, while VA and FHA applications jumped abruptly. 1958 starts now seem destined to top one million, giving appliance sales an upward nudge and driving residential kwhr sales and average residential use to creditable new highs (p 131).

INDUSTRIAL ▶ **A high frequency resistance welding head is making a triple hit** with a Brooklyn aluminum manufacturing concern. In addition to saving a healthy 23% in material costs, the firm also reports a big reduction in inventory requirements and a smoother operation (p 128).

NEW EQUIPMENT ▶ **Two-cycle operation is featured in new metal-clad switchgear** with horizontal drawout now available for 4.16-kv systems. The breaker can be changed from disconnect to connect in less than 15 sec . . . New compression connectors have been designed for use where tap is larger than line wire. The unit is recommended for dead-ending and tapping on all combinations of aluminum, ACSR, and copper (p 108).

MANUFACTURERS ▶ **An electric network analyzer has joined the slide rule and log tables** as a tool vital to an engineering education at Lehigh University. The computer-like unit was built specially for educational purposes by I-T-E Circuit Breaker . . . A shared cost program to design and build a digital computer is launched by Leeds & Northrup and Philco (p 104) . . . Allis-Chalmers Pres Stevenson sounds an optimistic note for the composite Index of Industrial Production (p 107).

PEOPLE ▶ **Top Indiana PS posts go to R.A. Gallagher,** who becomes chairman and chief executive officer, and E. W. Hebel, president . . . PS of Oklahoma ups Wright Canfield to executive VP, G. I. Page to VP-operations . . . Three new VP's of Missouri P&L are R. H. Dawson, R. L. Fike, and C. L. Hitt (p 139) . . . R. H. Thompson becomes a VP of Central Illinois PS . . . Wagner Electric promotes G. W. Brown to executive VP and elects as VP's P. C. Ford and R. H. Hackett (p 140).

Elimination of the spare boiler feed pump is more justifiable today than in the past. Yet certain hazards must be faced when the spare is eliminated. One possible solution to this dilemma in a proposed 3- or more unit station is to provide a spare with the first unit, use the same spare for the second unit, and then "physically" transfer this spare to the third unit for one of its operating pumps. By the time the third unit is installed most contributing factors to "infant mortality" (failures in early stages of operation) will have been ferreted out and corrected.—**I. J. Karassik, Power and Fluids, Winter, 1958.**

TECHNICAL NOTES

Infrared camera is latest trouble-shooting tool. It gives a quantitative photographic record of the heat distribution of the object pictured. Recorded heat patterns can detect faulty welds, overheated machine parts, and defects in metal castings.

Copper corrosion is retarded by sunlight or other intense light. Although the mechanism for this behavior is not known, a possible explanation is a copper-cuprous-oxide photo cell theory which centers upon the semiconductivity of cuprous oxide.

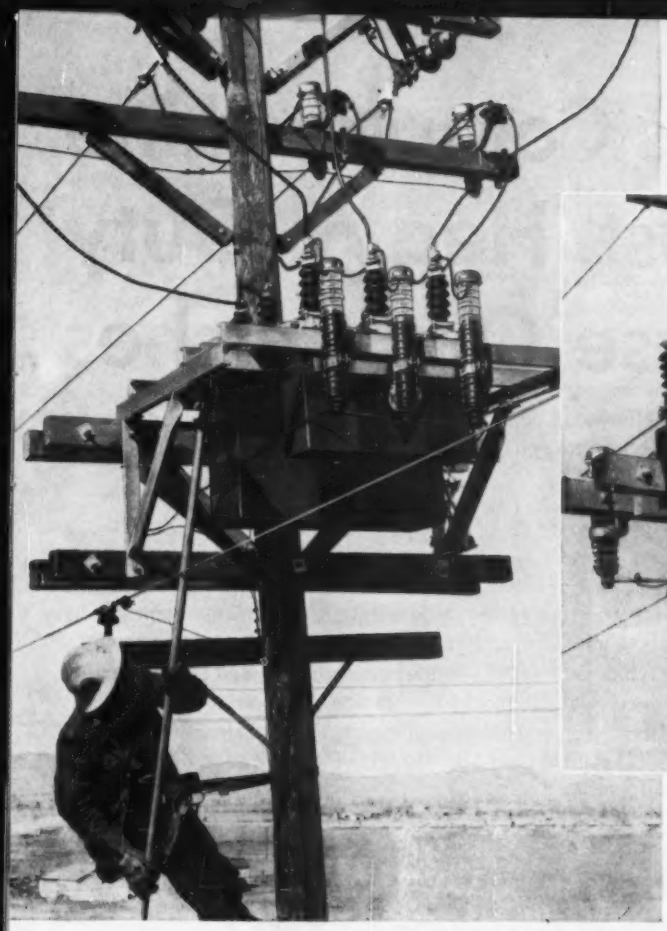
One kilowatt of electricity is required to enrich enough atomic fuel to yield two kilowatts of electricity. But it requires only one pound of coal to provide enough power to mine 145 pounds of coal.

Ultrasonic vibrations have been utilized to weld metal. Through high-frequency sound alone, two pieces of metal can be joined as a result of a molecular transference or plastic flow at the interfaces of the two metals at a temperature below the melting point of either metal.

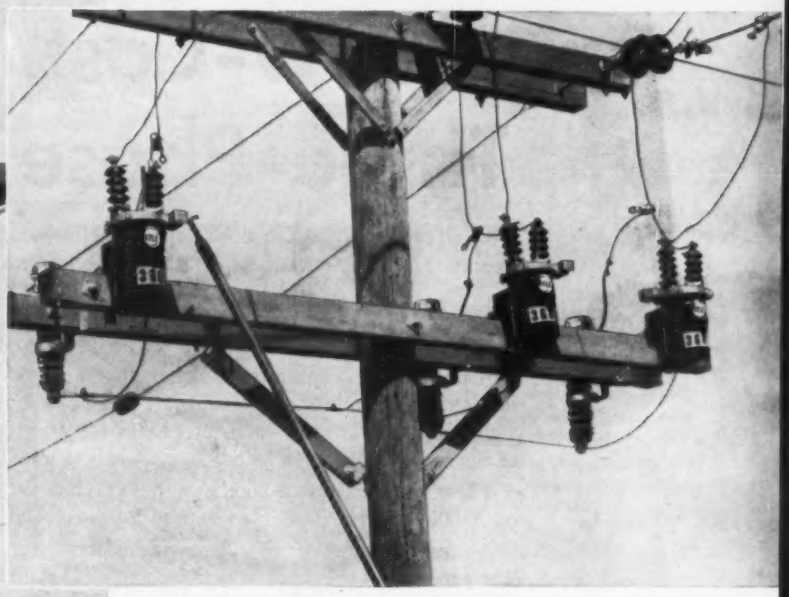
FROM EDITORS IN THE FIELD

Plant mechanization is boosting power requirements. One operation at Edward Valve Co East Chicago plant previously performed with a 5 hp motor, now requires a 2,000-kw machine. And it appears that the 2,000-kw machine with be replaced with a 4,000-kw unit.

Water-cooled stator will be used for a 300-Mw turbine generator according to reports from Russia.



THREE-PHASE 185-ampere Kyle Type R recloser with 200-ampere ground tripping protects the main circuit from faults on a 3-phase branch line in Denver.



THREE 140-AMPERE single-phase Kyle sectionalizers protect the main feeder from faults on short branch lines, and also sectionalize areas behind reclosers. These are operated either by recloser or station breaker.

Report From Public Service Company of Colorado...

Standard Recloser Application Program Conserves Time For Utility's Engineers

Fundamental plan simplifies application of reclosers and sectionalizers; conserves engineering, record-keeping, and storekeeping time; gives better conductor protection.

A standard application plan for reclosers and sectionalizers offers many advantages. With a predetermined program, this equipment is selected and installed according to the plan, without any further engineering.

Basically the plan consists of selecting certain ratings of reclosers and sectionalizers to be applied to branches according to load, line length, and exposure. The plan automatically assures adequate protection against burndowns, gives better assurance of service continuity, and insures coordination.

Public Service Company of Colorado is an outstanding example of a utility with a fundamental protection plan. According to Messrs. Hayden, Martin, and Tilson, electrical engineers for P.S. Company, in the first year "savings in engineering time, record-keeping, and storekeeping have been so obvious as to warrant considerable enthusiasm. Also field experience so far has been most gratifying, because it has indicated that definite and concrete operating benefits have been and will continue to be enjoyed as a result of this plan."

This and other programs provide for complete flexibility. In the original program, any ratings and sequences that engineering prefers are selected. Thereafter the plan is applied automatically. The plan provides for switching or dividing load areas or feeders, and for taking care of increasing loads.

Ask Us For Details

Bulletins on Kyle Reclosers and a copy of a paper on the Colorado plan are available. We'll be glad to supply you with copies. Ask the L-M Field Engineer, or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

McGRAW-EDISON

LINE MATERIAL Industries Kyle® Reclosers

McGRAW-EDISON COMPANY

337

Only L-M Offers Complete Line of Low-Cost, Heavy-Duty Three-Phase Oil Switches

Now all types of loads—capacitive or inductive—can be switched economically with manual or remote operation, using one of the Kyle "V" family of three-phase oil switches.

Three Types of Switches

L-M's Kyle "V" family consists of three basic types of switches:

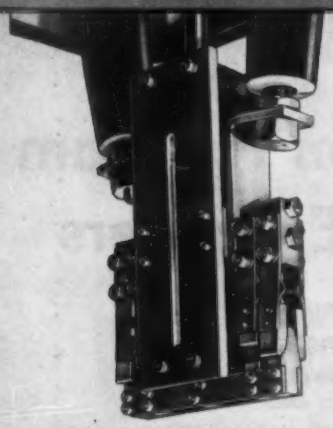
1. One for general-purpose switching, such as single-step capacitor switching and automatic transfer of normal power-factor loads.

2. One for automatic transfer and tie schemes involving loads having low lagging power-factor currents, such as unloaded motors.

3. One designed specifically to withstand the severe duty imposed by step-switching capacitors.

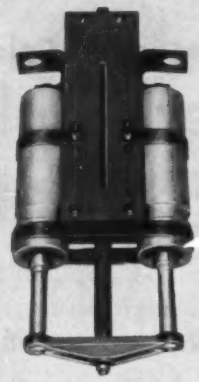
These switches have a maximum design voltage of 15.5 kv, a momentary rating and latching rating of 20,000 amperes (asymmetric), and a four-second rating of 6,000 amperes (symmetric).

All three switches are available with motor-driven actuator assembly for remote electrical operation. The general-duty (1) and inductive-current (2) switches are also available for hook stick operation, or with remote manual linkage for operation from base of pole.



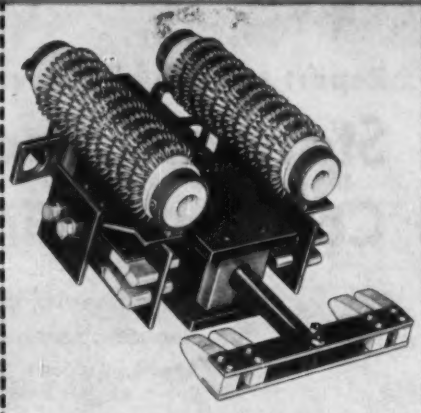
GENERAL DUTY CONTACT ASSEMBLY

Copper-tungsten arcing contacts absorb the punishment of switching, keeping erosion on load contacts at a minimum.



INDUCTIVE CURRENT CONTACT ASSEMBLY

Interrupting tubes assure minimum arcing time during load-current interruption, thus enabling the switch to handle currents with power factor as low as 10% lagging.



STEP CAPACITOR CONTACT ASSEMBLY

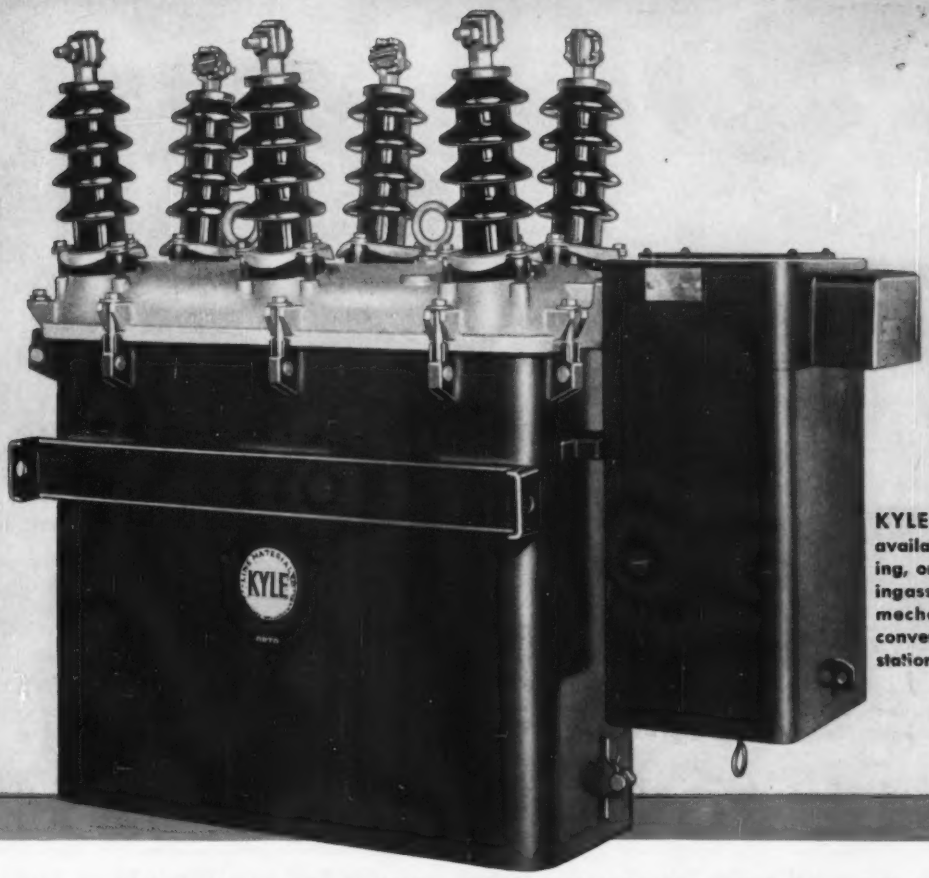
7½ ohms of resistance in series with arcing contacts limits the high-frequency transient inrush to values within the short-time capability of the switch.

Get More Complete Information

L-M offers the most complete line of oil switches and accessories for manual and automatic load transfer and switching schemes. Ask your L-M Field Engineer for information and bulletins. Or write Line Material Industries, Milwaukee 1, Wisconsin.

LINE MATERIAL Industries

McGRAW-EDISON COMPANY



KYLE "V" SWITCHES are available for crossarm mounting, or with substation mounting assembly, including hoisting mechanism, to provide for convenient and versatile substation installation.

KYLE® Heavy-Duty, Three-Phase Oil Switches 400 Amp. 110 kv BIL

2.4 kv through 14.4 kv • Maximum design voltage 15.5 kv • Momentary rating 20,000 amps (asymmetric) • Four-second rating 6,000 amps (symmetric)

	SWITCHING RATINGS	TYPES	PRICE	APPLICATIONS
General Duty Switch	**7.2 kv through 14.4 kv** 75-100% p.f. 200 amps rms 40-75 % p.f. 100 amps rms 10-50 % p.f. 50 amps rms **2.4 kv through 7.2 kv** 75-100% p.f. 400 amps rms 50-75 % p.f. 200 amps rms 10-50 % p.f. 100 amps rms	**Hook Stick Operation** **Remote Electrical Operation** **Remote Manual Operation**	**VH $625** **VR $885** **VM $710**	Manual sectionalizing switches. Automatic transfer schemes for duplicate service, feeder switching, bus transfer switching, bus ties. Single-step capacitor switching.
Inductive Current Switch	Switches are capable of switching their full continuous rating, 400 amps from unity power-factor down to 10% lagging power-factor.	**Hook Stick Operation** **Remote Electrical Operation** **Remote Manual Operation**	**VLH $655** **VLR $915** **VLM $740**	Automatic transfer and tie schemes involving low lagging power-factor currents.
Step Capacitor Switch	Nominal capacitor switching current 300 amperes	**Remote Electrical Operation**	**VCR $1055**	Designed specifically to withstand the severe duty imposed by multi-step switching of capacitor banks.

The Kyle Type VR, VLR and VCR switches are equipped with motor-operated actuator mechanisms to make possible remote electrical operation. Such remote operation can be initiated either by push button or through current, voltage, time-sensitive, or other relay scheme.

ACCESSORIES

Available on VR, VLR, and VCR.

A 1, 2, 3, or 4-stage auxiliary switch can be factory installed for use when the VR switch is used with relay or interlocking schemes or switchboard position indication.

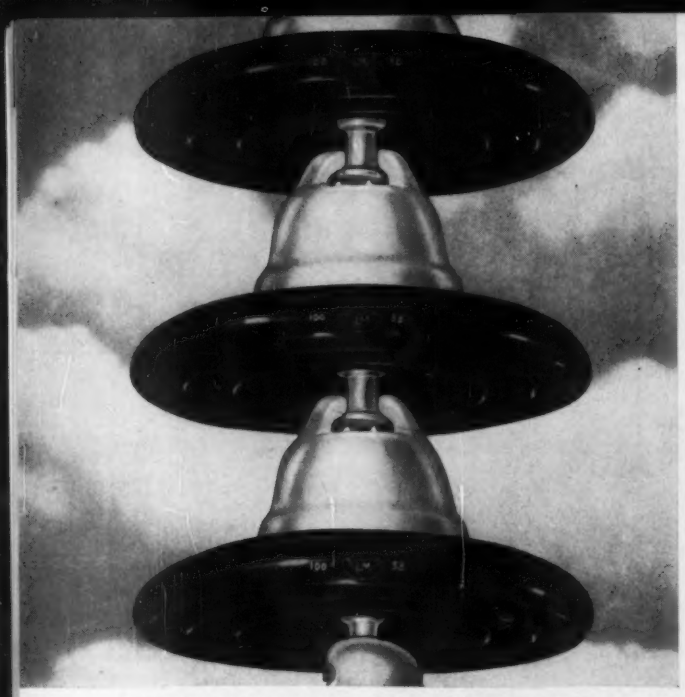
Low-voltage arresters can be installed within the actuator housing.

Heating element can be installed in the actuator housing when application is in unusually damp, foggy, or humid atmospheres.

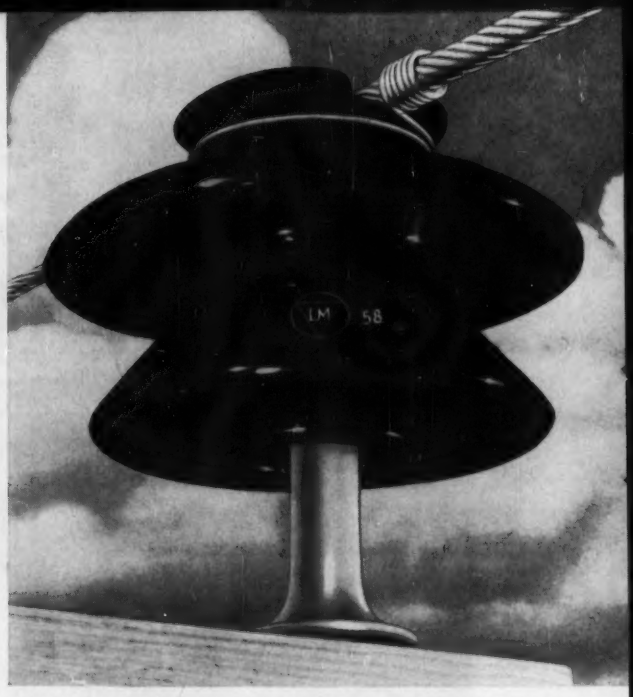
15" and 17" creepage distance bushings are available for the entire family of switches.

Kyle® Oil Switches

McGRAW EDISON



L-M HIGH-VOLTAGE, 10-inch suspension insulator has many outstanding features, including high-grade malleable or forged caps, and forged steel, "Cor-Ten", or stainless steel pins.



L-M HIGH-VOLTAGE pin-type insulators are available with radio and TV noise-proof glaze in standard production. Skirts are designed to provide good self-washing action.

Now It's "L-M Porcelain"

With new standards of material testing, manufacturing controls, and rigid final tests, Illinois Edison Porcelain products are now being shipped under the name of Line Material Electrical Porcelain Insulators.

For five years Illinois Edison Porcelain has been under Line Material operation. During this time, L-M has made extensive changes in production procedure, quality control and final testing to insure uniformity, consistently high strength, and insulating value in the product.

The porcelain insulators shipped from this plant are now marked with the L-M trademark. They are the highest quality available in the industry today.

Extensive Control and Testing

A completely new ceramic laboratory has been built for testing raw material and production methods. New, accurately controlled molding, pressing, drying, and glazing equipment has been installed to assure maximum uniform density and strength in the porcelain. A new, completely automatic kiln is now in production. Facilities also include a modern galvanizing plant for maximum processing control of the associated insulator hardware. With the most modern plant in the industry, L-M aims to supply the highest quality.

Meet EEI-NEMA Standards—With Plenty To Spare

Line Material porcelain includes pin and suspension insulators, strain insulators, switch and bus insulators. All meet EEI-NEMA standards with an ample margin.

Get Complete Information

Ask your L-M Field Engineer for complete information, and a copy of informative Bulletin DL8; or write Line Material Industries, Milwaukee 1, Wisconsin.

LINE MATERIAL Industries
McGRAW-EDISON COMPANY

McGRAW EDISON

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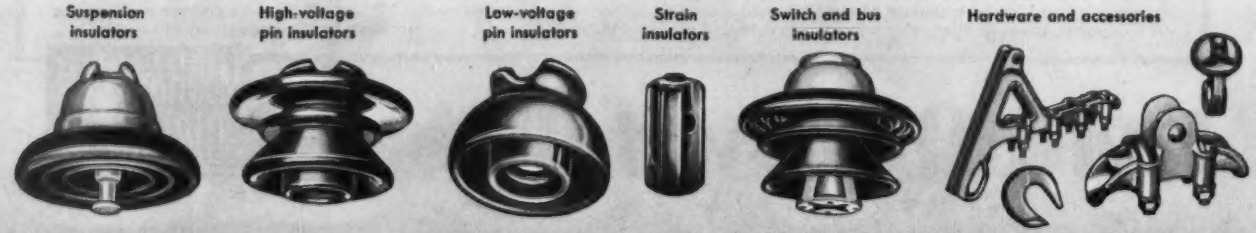
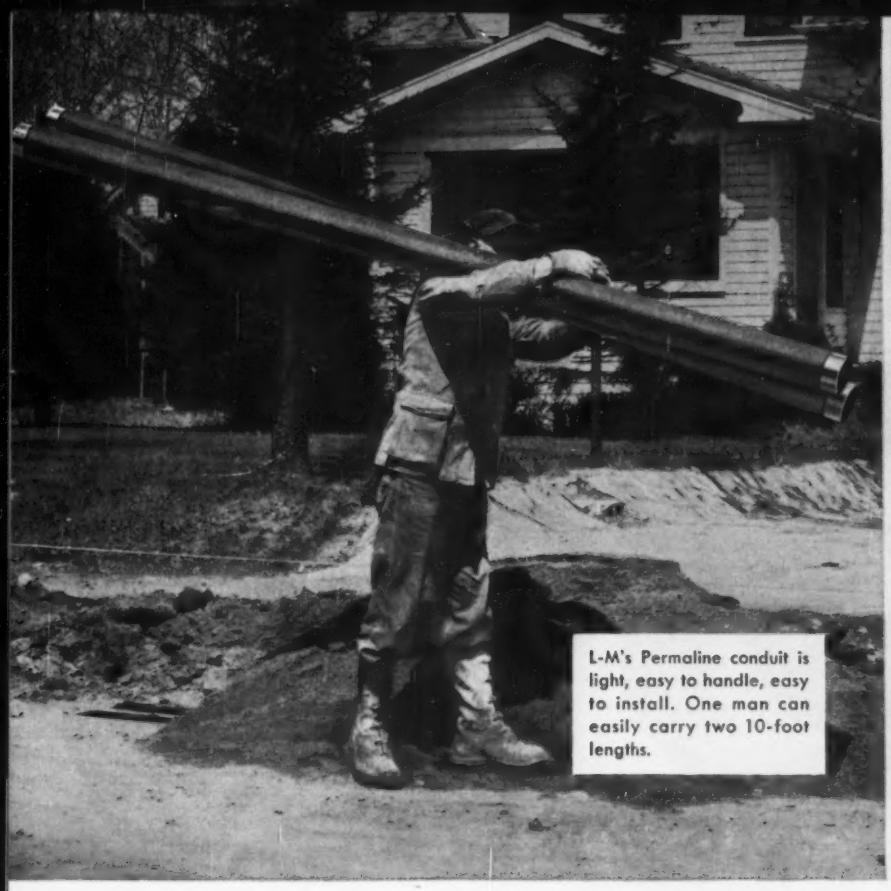
Electrical Porcelain Insulators

L-M offers an extensive line of suspension and strain insulators, and hardware accessories





L-M's Permaline conduit is light, easy to handle, easy to install. One man can easily carry two 10-foot lengths.

L-M's extra-long 10-foot lengths of Permaline conduit speed installation. Simply tapping the tapered coupling onto the tapered end of the conduit makes a strong, watertight joint—no caulking needed.

Saves Time and Labor...

Contractor Eliminates 13,750 Joints

With Long 10-foot Lengths of L-M Permaline Conduit!

Now, with L-M's exclusive 10-foot lengths of Permaline fibre conduit, you can eliminate 20% to 50% of the joints to be made on a job, and thus cut costly construction time and labor.

On one job requiring 550,000 feet of conduit, the contractor eliminated 13,750 joints by using L-M's long 10-foot lengths as compared with 8-foot lengths.

It will pay you to use L-M's time- and labor-saving 10-foot lengths of Permaline conduit for your next duct job. L-M Permaline is the original 10-foot-long fibre conduit.

Easy to Install

L-M lightweight Permaline fibre conduit is also easy to install. Joints are quickly made by simply tapping the tapered coupling onto the tapered end of the conduit. Joints are watertight and safe from seepage. Smooth bore reduces cable sheath abrasion. Completely engineered system for installation includes full line of bends, bell ends, couplings, and base and intermediate spacers.

L-M Permaline fibre conduit comes in 5, 8 and 10-foot lengths. Available diameters include 2, 3, 3½, 4, 4½, 5 and 6-inch sizes.

Get Complete Information

Ask the L-M Field Engineer for a copy of the 12-point plan folder which shows how easy it is to use the Permaline system; or Fibre Conduit Bulletin UG1A, which gives complete specifications. Or write Line Material Industries, Milwaukee 1, Wisconsin.

310R

LINE MATERIAL Industries

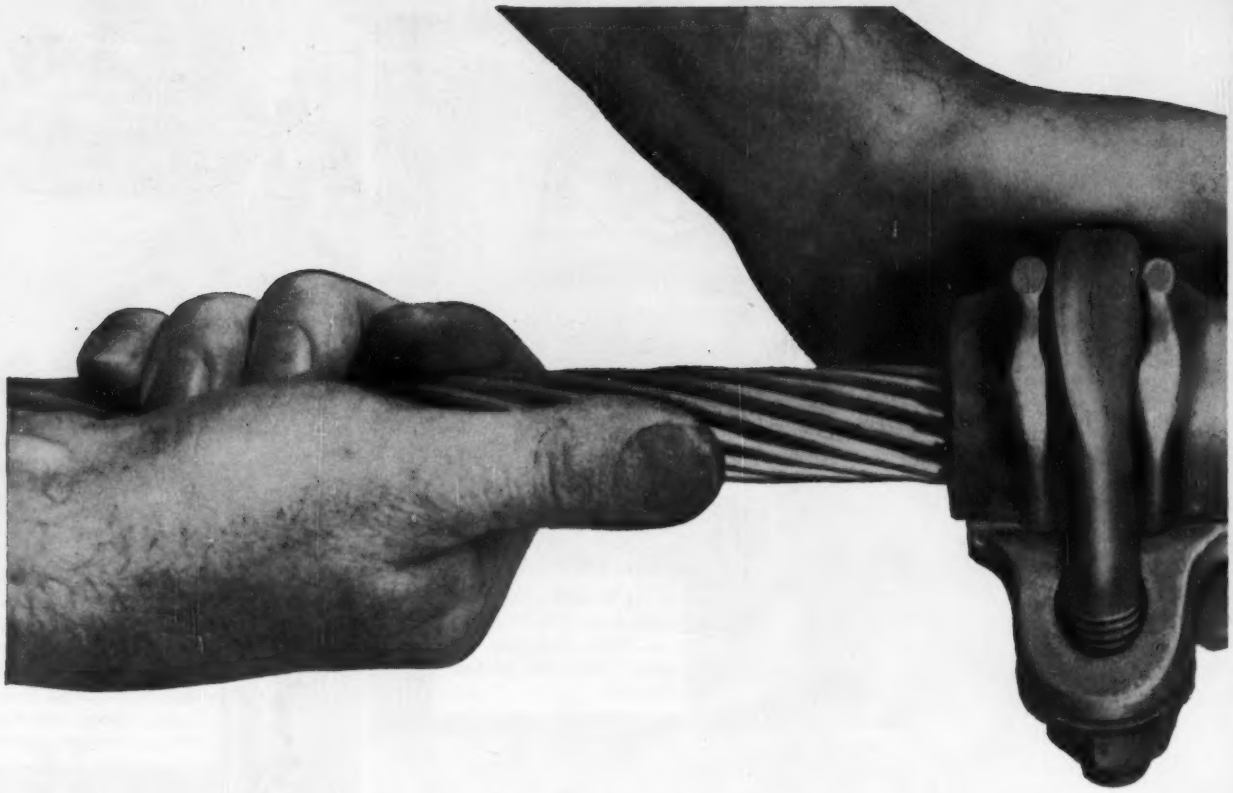
McGRAW-EDISON COMPANY

McGRAW EDISON

Permaline Fibre Conduit

BPI

This seal is your guarantee of recognized quality in Bituminous Fibre Conduit.



NEW! Terminal and Tee Connectors with ALCOA UNIVERSAL GROOVES

This new series of bolted terminal and tee connectors has been designed with Alcoa's heavy-duty universal groove. This is the same groove that is used in Alcoa's new series of clamps now winning praise from utility men.

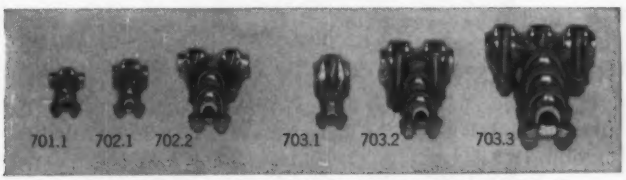
It takes only three groove sizes to accommodate the full range of ACSR from #2 to 715.5 MCM and #2 to 800 MCM stranded aluminum. This feature introduces easier ordering, simplified stocking and low inventories. Because we stock these items, you can also expect fast delivery. And, best of all, you get all these benefits at low cost.

With all these extras, you still get top Alcoa quality. Dependability and service have been proved by months of extensive laboratory testing. The bolts are anodized and lubricated to reduce thread friction, and all parts are aluminum to equalize expansion, eliminate corrosion. The grooves are specially treated and coated to provide low contact resistance. Copper bushings are available if desired.

Call Alcoa to see samples of the new terminal and tee connectors. Or write for more information—ALUMINUM COMPANY OF AMERICA, 2306-E Alcoa Building, Pittsburgh 19, Pennsylvania.

Functional catalog numbers: last digit is groove size, letter indicates tongue size.

TERMINAL CAT. NO.			GROOVE RANGE					
Str. Pad	45° Pad	90° Pad	Diameter		ACSR		Strand. Cond.	
			Min.	Max.	Min.	Max.	Min.	Max.
720A	730A	740A	.162	.325	6	2	6	2
721A	731A	741A	.292	.502	2 6/1	3/0	2	3/0
722B	732B	742B	.464	.743	3/0	397.5 18/1	3/0	400M
723B	733B	743B	.743	1.060	397.5 18/1	715.5 26/7	450M	800M
723D	733D	743D	.743	1.060	397.5 18/1	715.5 26/7	450M	800M



Functional catalog numbers: digit to left of decimal is number of run groove, digit to right is tap groove.

ALCOA ALUMINUM UNIVERSAL GROOVE RANGES

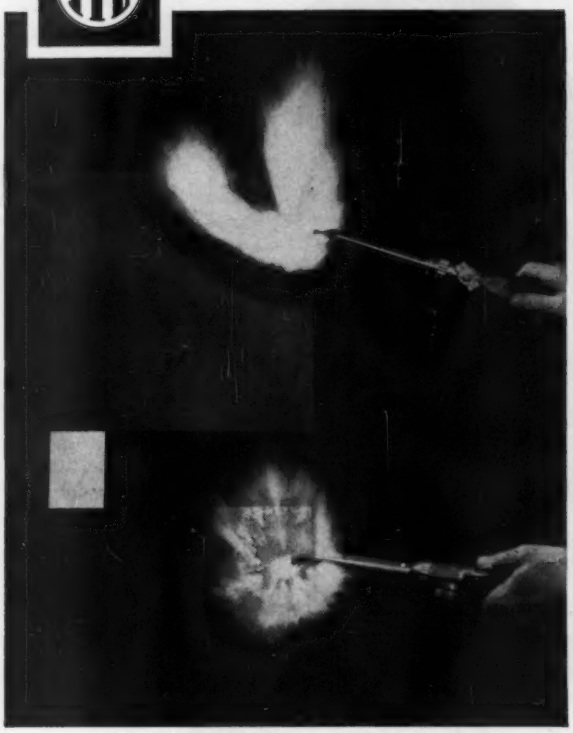
GROOVE DIAMETER			ACSR		STRANDED COND.	
	Min.	Max.	Min.	Max.	Min.	Max.
1	.292	.502	2 6/1	3/0	2C	3/0
2	.464	.743	3/0	397.5M 18/1	3/0	400M
3	.743	1.060	397.5M 18/1	715.5M 26/7	450M	800M

ALCOA ALUMINUM
ELECTRICAL CONDUCTORS AND ACCESSORIES
ALUMINUM COMPANY OF AMERICA

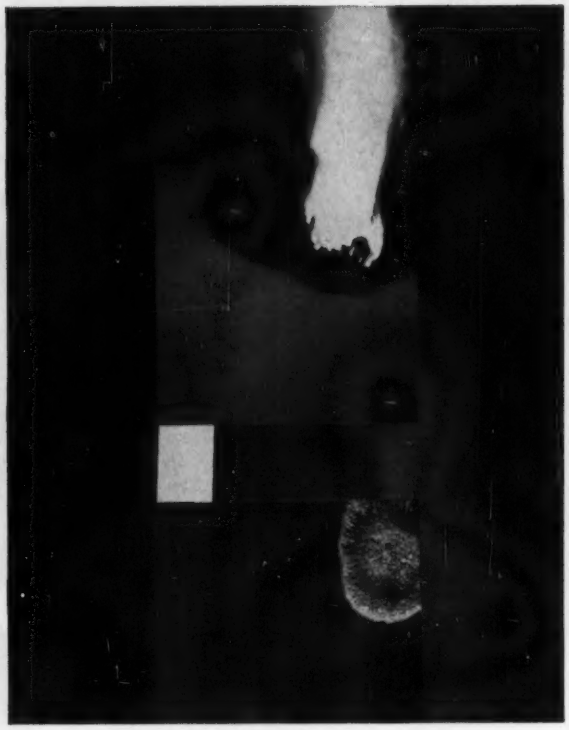
Your Guide to the Best in Aluminum Value

"ALCOA THEATRE"
Exciting Adventure, Alternate Monday Evenings

METAL-CLAD SWITCHGEAR



TORCHES IGNITE FLAMETRAP (bottom) and conventional insulation (top) simultaneously.



SECONDS LATER, FLAMETRAP has snuffed out, but conventional insulation still burns briskly.

New FLAMETRAP Insulation Snuffs Out Flame ...No Toxic Gases...Highest Arc Resistance

FLAMETRAP INTERPHASE BARRIER. Standard equipment on I-T-E 5 and 15 kv switchgear at no increase in price.

Take the heat away, and this new I-T-E developed FLAMETRAP insulation snuffs out . . . fast! This is today's most advanced flame-retardant insulation, and it is used exclusively in I-T-E Switchgear.

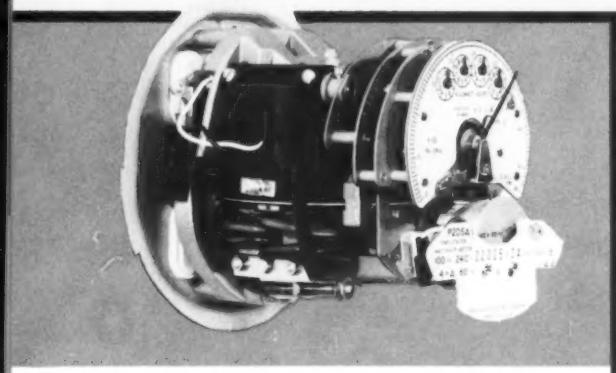
FLAMETRAP contains melamine resin—heretofore considered too expensive for commercial application. Unlike substitute ingredients, melamine gives off no toxic gases when it burns. So FLAMETRAP is far safer. And melamine stands up better under high temperatures. So FLAMETRAP suffers less from arc damage.

This latest improvement puts I-T-E switchgear even further ahead of the pack. It is one more of the quality details that keep coming your way from I-T-E without increase in price.

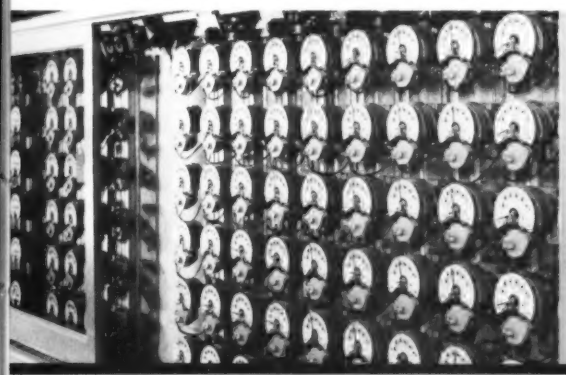
I-T-E service is as near as your telephone or mailbox. Why not call or write today. I-T-E Circuit Breaker Company, Switchgear Division, 19th & Hamilton Sts., Philadelphia 30, Pa. In Canada, Eastern Power Devices Ltd., Port Credit, Ont.

I-T-E CIRCUIT BREAKER COMPANY
PHILADELPHIA, PENNSYLVANIA

NEW... SANGAMO MECHANICAL DEMAND METERS



Sangamo's new two-stator four-wire delta meter with a Type D Mechanical Demand Register installed. Meter disk is readily visible from any angle.



Every Type D Mechanical Demand Register is thoroughly tested for accuracy. This group of registers is being given time run tests in the Sangamo factory.

Type P2D

with a new concept in Mechanical Demand Registers

Sangamo's new Type D Mechanical Demand Register, when installed on any of the Sangamo Type P2 extended range watthour meters, accurately measures KW demand on all polyphase loads.

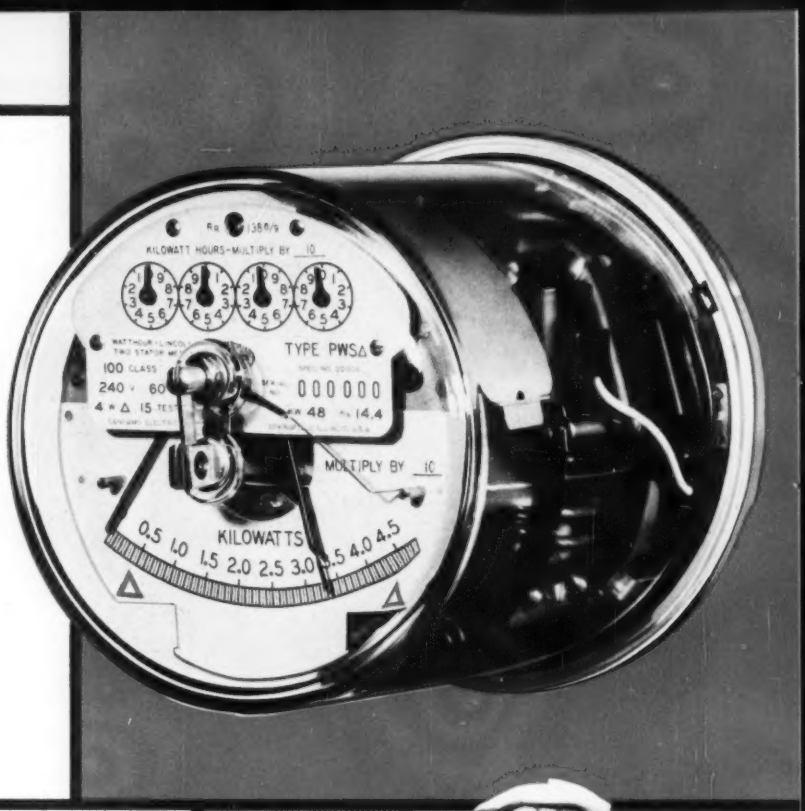
Universal and standard Type D Registers have—*full scale capacities* to match both Class 100 and 200 meters —time interval indicator—*clutch free* arrangement for disengagement of the timing motor with *no* mesh adjustment.

Trouble free service is assured by—the proven Sangamo slow speed, high torque timing motor—timing gear shafts with polished stainless steel pivots—permanently lubricated porous bronze bearings—jeweled and nylon thrust bearings—and Sangamo's field proven, clutch free gravity reset mechanism.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

NEW... SANGAMO THERMAL DEMAND METERS



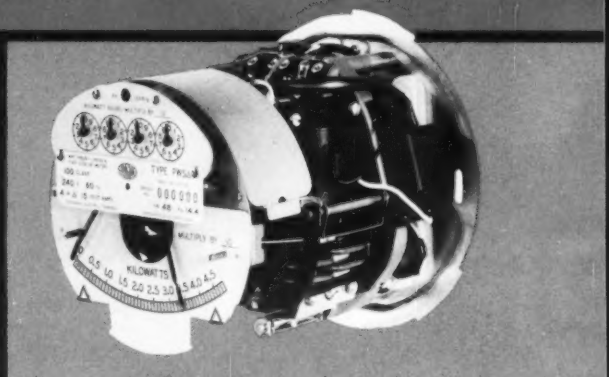
Type PWS△

compact polyphase Watthour and Lincoln Demand Meter

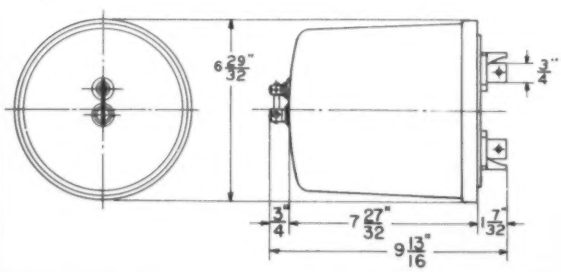
This new addition to the Sangamo Type P Meter Line combines the features of the new two-stator four-wire delta meter with a Lincoln watt demand meter of capacity to match the watthour meter. The Type PWS△ offers many advantages for thermal demand measurement of all polyphase circuits.

It's *easy to read*—easy to adjust. Kilowatthour dials are never obstructed by the demand pointers. Simple and easily reached adjustments are provided for both demand and watthour meters.

Simplified Design. Register assembly can be removed without disturbing soldered connections to give ready access to the watthour meter components. All demand meter secondary leads are solder-connected at convenient junction blocks. The watthour meter—including the bearing system—is *guaranteed for life!*



All new design—presents a compact assembly in which the watthour meter and the demand meter are complete units that function independently on entirely separate circuits.

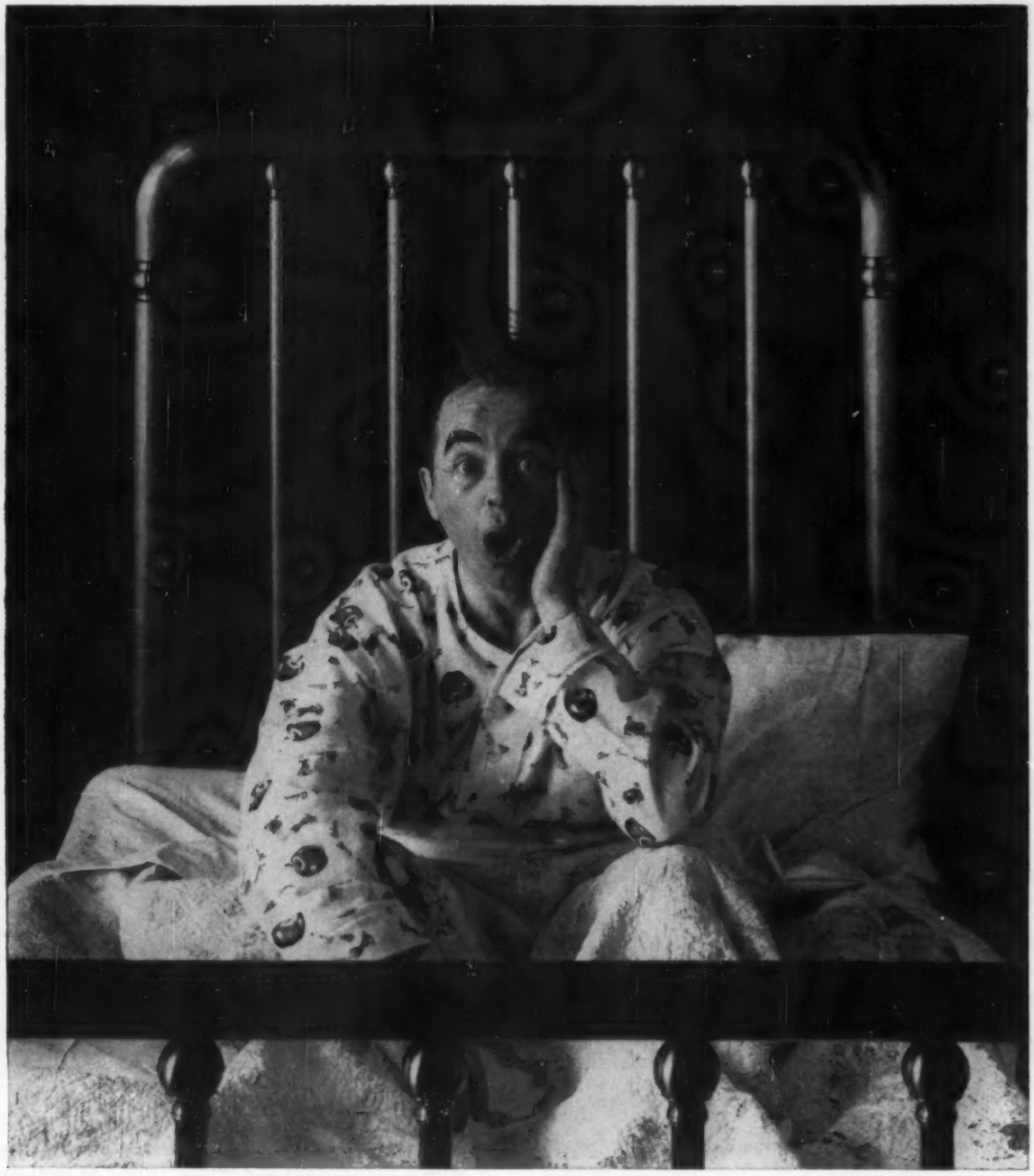


The Type PWS△ is mounted on a high strength aluminum base plate and is enclosed by a conventional round glass cover. It's built like—and looks like—the popular Sangamo Type J2TS.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

SM56-3



I dreamed I paid $1,000 for a cutout!

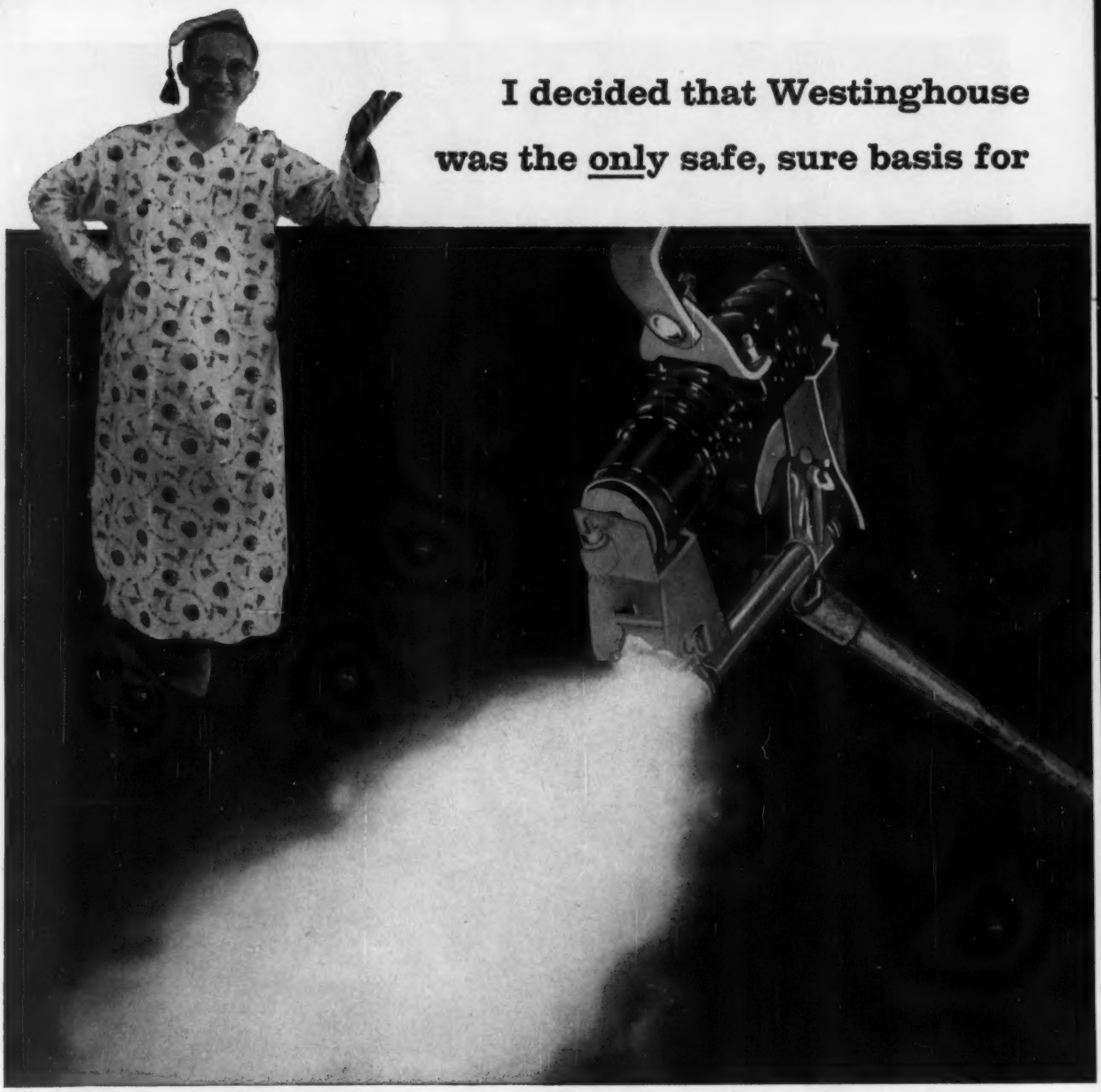
I woke up the other night in a cold sweat. This dream was as real as life . . . *a thousand bucks for a fuse cutout* . . . wow, what a nightmare!

But . . . then I realized that if the cutouts I bought didn't give me the *protection* I thought I was buying (even though their initial cost was pretty small) . . . the "real cost" of a single cutout *could be* as much as $1,000. If a sectionalizing cutout failed, the "real cost"—the resulting damage—could easily reach this amount. A cutout failure could mean a major outage with loss of revenue and customer good-will, cost of an extra service trip to replace the cutout and perhaps even damage to expensive adjacent equipment.

I'm sure glad it was only a dream . . . but it made me stop and think about this problem. How did we *know* our fuse cutouts would really interrupt rated faults? *Was I really getting full value for my protection-investment?*

J-60948-1

Turn the page to learn how Westinghouse promises PA's a sound night's sleep



I decided that Westinghouse was the only safe, sure basis for

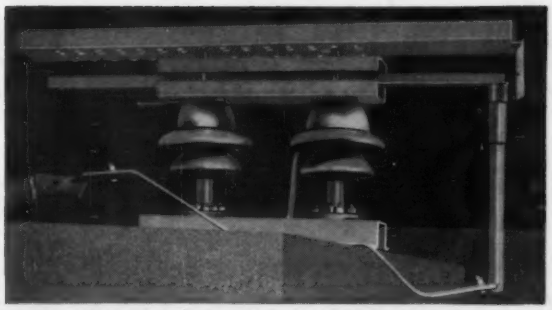
Their grueling development test procedure guarantees me full value for my protection-investment

After my $1,000 cutout nightmare, I visited the Westinghouse High Power Lab to watch them testing their open-fuse cutouts. They have the toughest battery of tests I've ever seen. It really opened my eyes the way Westinghouse cutouts shrugged off those punishing shocks from high-current interruptions. The DX cutout cleanly interrupted all faults from minimum melting of the fuse link right up to the maximum interrupting rating of the cutout . . . and then the same fuse tube cleared currents even 150% above their maximum rating without a single tube failure or flashover.

Watching the wallop some of these high-current interruptions gave the cutout really put across the importance of rugged components such as hinges, clamps, brackets and porcelain insulators. I never dreamed (no pun intended) a manufacturer spent so much money in testing and developing a product that's so inexpensive we'd come to regard it as just another piece of hardware. In the Westinghouse High Power Laboratory and High Voltage Labs, I witnessed an exhaustive series of tests: interrupting, temperature rise, radio interference, impulse tests, wet and dry withstand tests, vibration tests . . . and even severe packaging tests.

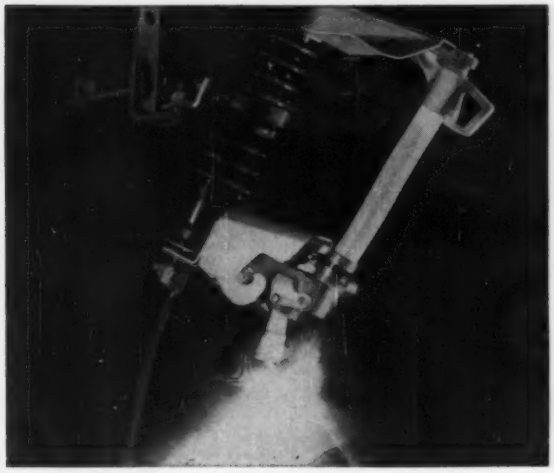
And when the design engineer was confident enough to walk up to the DX cutout and casually close in on a fault of 100% of its interrupting rating (as shown in the Lab above), I knew I was getting all the protection we were paying for . . . and a whole lot more . . . when we bought Westinghouse fuse cutouts. J-60948-2

complete electrical testing selecting a cutout!



Here's how Westinghouse **PLOWBACK** of earnings into research insures full value for your protection-investment!

Anyone can set up a test on a cutout. All it takes is a fairly large transformer, a breaker and a cutout. But, to start with fundamental research on the rocket action of the basic fuse tube of various materials, sizes and lengths and follow-through to the final verification tests on the complete product . . . testing each part that is subject to the shock of interruption . . . takes engineering know-how, time and test facilities . . . found only in the Westinghouse High Power Laboratory. This time-consuming but sure method of development costs money . . . lots of it, but really sure protection comes only from thorough electrical testing as was used in the development of the Westinghouse DX cutout and not from a design based on theory alone.



Completely safe load breaks

Load break interruption at full rated capacity proved the complete safety of this device for manual sectionalizing of distribution lines and capacitor switching. Arc is extinguished inside rugged Micarta® tube . . . with no arcing at contacts. This Westinghouse load break device provides a safe, easy and economical circuit interrupting device.

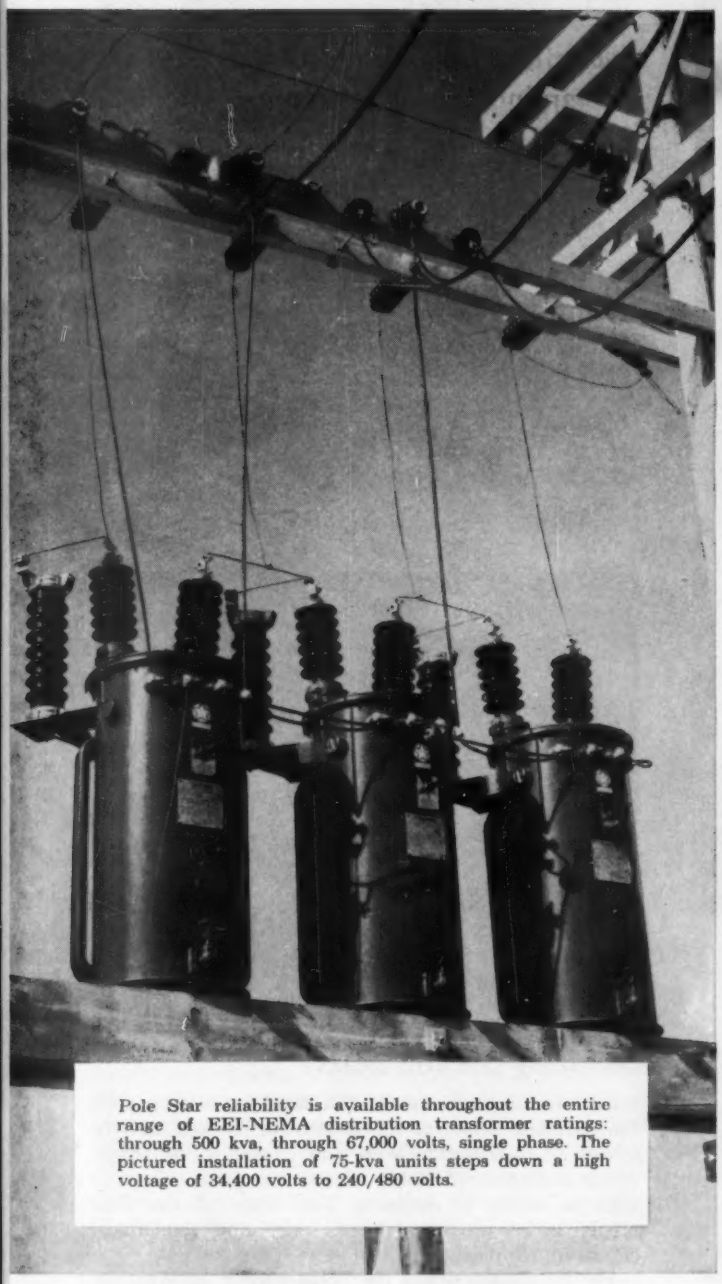
For full details about the "plus values" in Westinghouse DX open-fuse cutouts, call your Westinghouse sales engineer or write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

J-60948-3

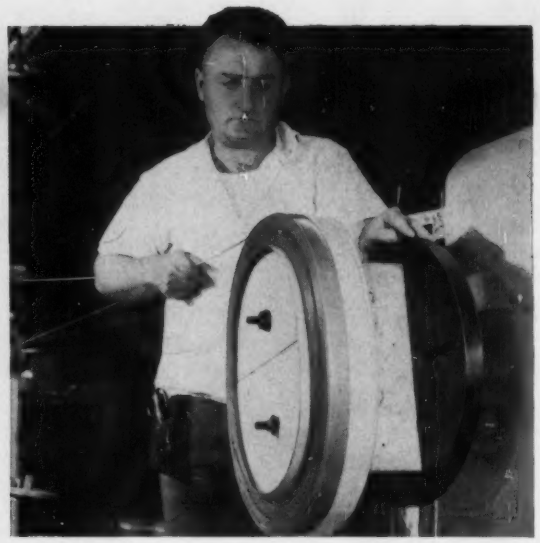
YOU CAN BE SURE...IF IT'S Westinghouse

Electrically, Mechanically... POLE STAR

the ruggedness that's needed

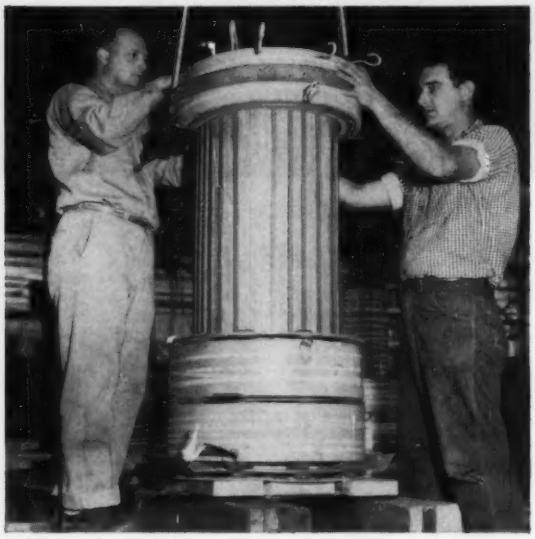


Pole Star reliability is available throughout the entire range of EEI-NEMA distribution transformer ratings: through 500 kva, through 67,000 volts, single phase. The pictured installation of 75-kva units steps down a high voltage of 34,400 volts to 240/480 volts.



Above: Sections of Pole Star high voltage coils are wound on precise molds to assure uniform dimensions. Maintenance of proper tension on the wire, plus the use of thin layer insulation, produces coil sections that are completely firm, without "sponginess."

Below: High voltage coil sections are snugly fitted over the layer-wound low voltage coil. A free flow of oil for cooling is assured by the liberal use of spacers—between the high voltage sections as well as between the high and low voltage coils.



POLE STAR

PENNSYLVANIA POLE STAR

SECTIONAL COILS have

for high voltage applications

To obtain uniform distribution of voltage stresses throughout the winding is one of the principal reasons for using sectional high voltage coils in Pole Star distribution transformers rated 34.5 kv and higher. In addition to providing this basic advantage—which results in high resistance to lightning and other voltage surges of impulse magnitude—Pole Star sectional coils feature several Pennsylvania Transformer developments that play an important part in the *sustained performance* of Pole Stars under the most rigorous conditions.

Pole Star Bonding Process Provides Exceptional Strength

Like all Pole Star coils, high voltage sections are wound on precise molds to assure uniform dimensions. By carefully maintaining proper tension on the wire during the winding process, and by taking full advantage of the thinner layer insulation made possible by the Pole Star design, Pennsylvania Transformer craftsmen produce coil sections that are completely firm, with no "sponginess."

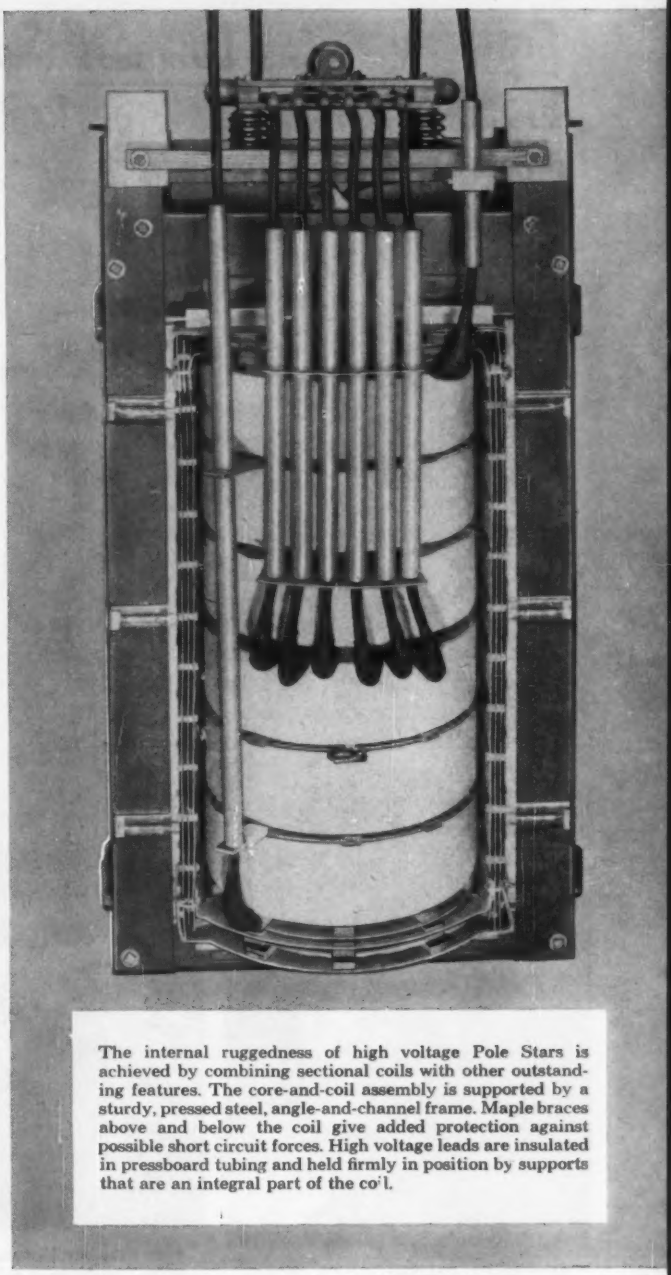
After high voltage sections are snugly fitted over the layer-wound low voltage windings, the completed coil undergoes a curing and drying cycle that firmly bonds each turn of wire to the adjacent insulation, by first softening and then polymerizing a special adhesive with which the kraft layer insulation is pre-coated. This procedure produces a coil with exceptional resistance to short circuit . . . and also assures high electrical strength by retaining the pliability of insulation and permitting the penetration of oil throughout the coil.

Crepe Insulating Collars Give Extra Margin of Protection

A primary reason for the compactness of Pole Star high voltage sectional coils—and for the space-saving, weight-saving transformers they make possible—is the efficient use of the best available insulating materials. For example, the crepe paper used with kraft insulation is folded over at the ends of the coil. This creates an insulating "collar" that achieves maximum electrical strength without adding unnecessarily to coil size. The additional puncture strength and creepage path this collar provides help create an impulse strength that liberally exceeds ASA-NEMA standard impulse levels.

These features and advantages all add up to the *ruggedness* that is needed for high voltage distribution transformer installations. For more Pole Star facts—or for a quotation on specific units—contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

McGRAW EDISON

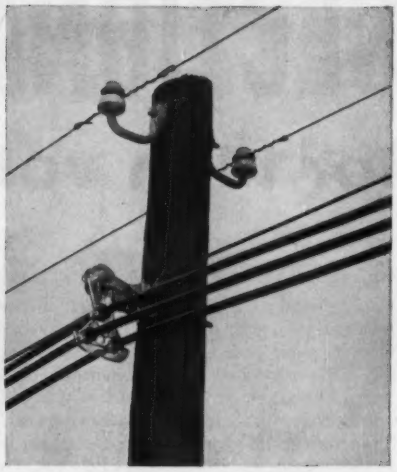


The internal ruggedness of high voltage Pole Stars is achieved by combining sectional coils with other outstanding features. The core-and-coil assembly is supported by a sturdy, pressed steel, angle-and-channel frame. Maple braces above and below the coil give added protection against possible short circuit forces. High voltage leads are insulated in pressboard tubing and held firmly in position by supports that are an integral part of the coil.

DISTRIBUTION TRANSFORMERS

pt

New Roeclamp with Roeplastic® Cable Costs 60% Less than Self-Supporting Cables, Minimizes Tree Problems, Installs with Ease, Looks Better!*



New Roebling ROEPLASTIC Cable with ROECLAMP requires only one foot of clearance through trees! Note improved, compact appearance. No crossarms are needed.

Designed for 5kv systems (2400/4160Y and 4800 v delta) and 8kv systems (4800/8320Y and 7200 v delta), the Roebling Aerial Spaced Cable actually costs 60% less than conventional self-supporting cables. It provides a neat, compact appearance, improved voltage regulation, higher current-carrying capacity, and positive phase identification.

Up to three conductors can be carried by ROECLAMPS, which are suspended from a strong messenger. The messenger also provides protection against lightning and falling limbs.

Aluminum conductors come in 17 standard sizes and strand constructions, and are made with a greater number of finer strands for extra flexibility. Standard insulation is extruded ROEPLASTIC P-11R7 (other extruded insulations available). ROECLAMPS come complete with grommets to fit cables and messenger you order.

Ask your Roebling representative to show you the remarkable new ROECLAMP. He'll tell you more, too, about the unusual savings and improvements you can effect, or write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

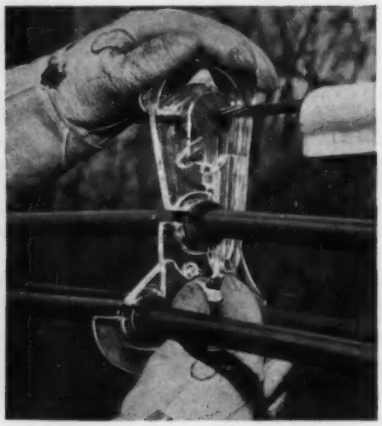
ROEBLING

Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

Roeclamp has unit construction... installs in seconds—without tools!

One motion and ROECLAMP is on messenger and ready to receive conductors. Phase changes and repairs do not necessitate removal of clamp. ROECLAMP comes complete with grommets to fit messenger and conductors you order.

Note how easily conductors drop into place. Installation is measured in seconds, even with "boxing gloves" on. ROECLAMP is Plexiglas†, tests to over 1000-lb. breaking strength, offers outstanding weather resistance, best possible electrical properties.



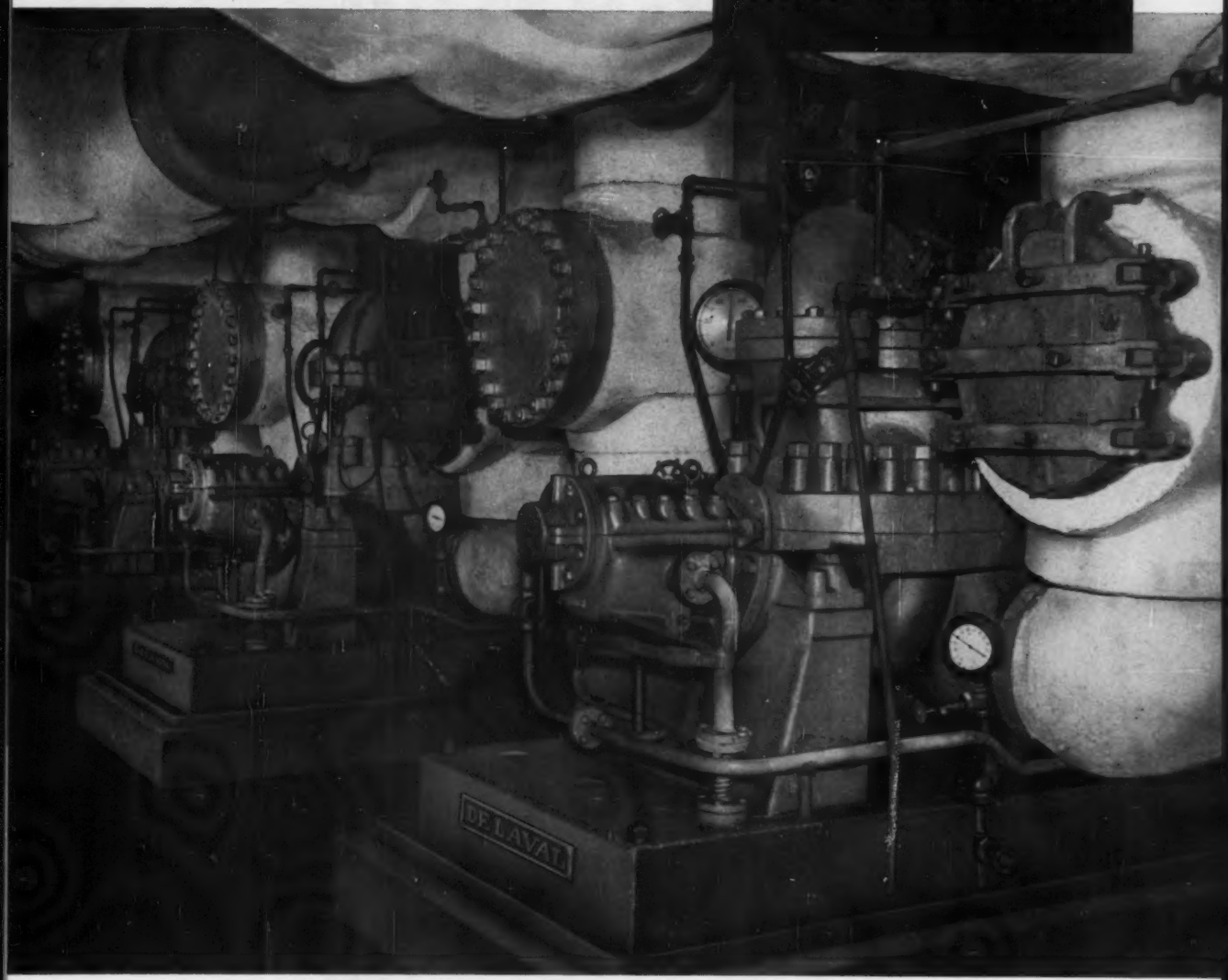
35 ROECLAMPS are required every 1000 feet. Installation is completed by hand-tightening of nut. Not even a screw driver is required!

*Pat. pending
†Reg. T.M.—Rohm & Haas Co.

Con Edison *reorders*

DE LAVAL

BOILER FEED PUMPS



The three De Laval Oppeller Pumps, shown in the photograph, do a dependable job of handling boiler feedwater at the East River Station of the Consolidated Edison Co. of New York. These three-stage pumps, with double-suction in the first stage, have a capacity of 2,000 gpm and operate at a discharge pressure of 620 psig. As proof of their reliable performance, Con Edison has ordered two identical units for the expansion of this station *plus* similar pumps for their Indian Point nuclear generating station.

Excellent for *medium* pressure and temperature service, De Laval Oppeller Pumps are designed with opposed impellers that balance axial thrust. Standard design features include sleeve bearings and labyrinth wearing rings which assure long economical service.

For *high* pressure, *high* temperature boiler feed service, De Laval offers the barrel-type pump . . . a single-suction, radially split diaphragm type multi-stage pumping unit inside a forged steel barrel.

For more data on these dependable pumps, write for Catalogs 1502 and 1506

DE LAVAL *Boiler Feed Pumps*

DE LAVAL STEAM TURBINE COMPANY

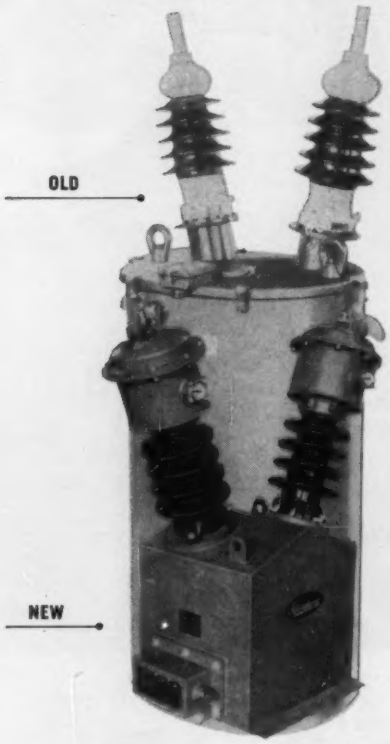
861 Nottingham Way, Trenton 2, New Jersey

DL 413

OUTDOOR METERING TRANSFORMERS...

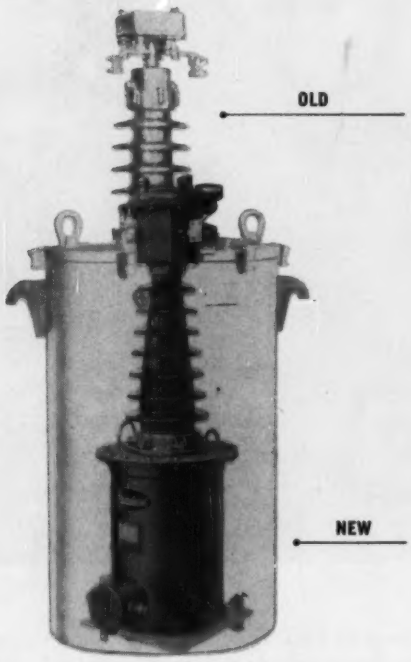
...accuracies within 0.3% at all ASA standard burdens

Standard Transformer's new line of completely redesigned outdoor metering transformers gives maximum accuracy on all metering applications. The vacuum impregnating process removes all traces of air from the heated core and assembly, resulting in the highest dielectric strengths. The new line conforms to all ASA, EEI and NEMA mounting and accuracy standards. These transformers are smaller and lighter than ever before. For specifications and certified dimension prints, see your nearby Standard Representative or write directly to us. You'll increase your accuracy where it counts most—ahead of and at the meter.



TYPE PXO OISC POTENTIAL TRANSFORMER

—outdoor type. Up to 69,000 volts primary; 120 volts secondary and secondary terminal box. Also available with single bushing for line to ground connection.



TYPE CWO OISC CURRENT TRANSFORMER

—outdoor type. Up to 69,000 volts; and up to 400/800 to 5 amperes. With oil level indicator, primary bypass protector, and secondary terminal box.

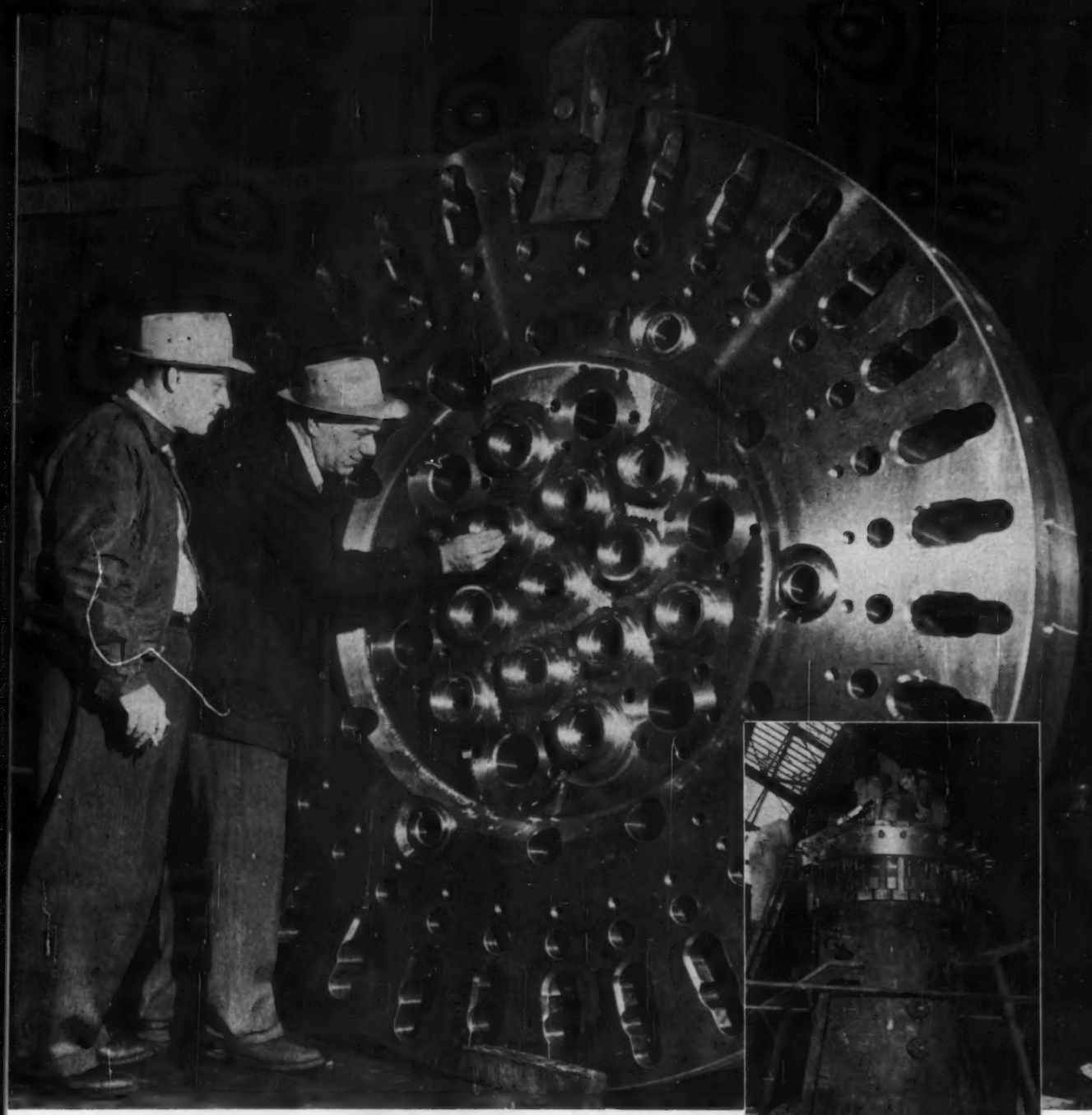
LIVE BETTER ELECTRICALLY

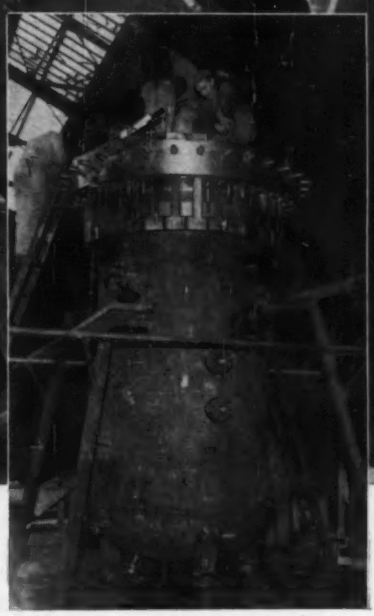
Phone 2-1563

Standard Transformer CO.

WARREN, OHIO

"WHEREVER THERE IS POWER"





This pressure vessel had to be designed with a closure that would open in 30 minutes, and withstand 1500 psi, 550F. Made of Type 304 stainless, the top head has 34 connections, of which 19 required exceptionally close tolerances for control rods.

FOR NUCLEAR NEEDS of Knolls Atomic Power Laboratory, M. W. Kellogg was given the exacting assignment of designing and producing a 32½-ton "Proof Test Reactor Pressure Vessel". This was an unusually complex task, because of the quick-opening closure specifications, requiring a head with novel design and extremely close tolerance machining.

FOR NUCLEAR NEEDS of others, Kellogg is supplying the primary coolant stainless piping for two nuclear plants. In addition, Kellogg is equipped to engineer and manufacture heat exchanger equipment for nuclear energy power plants. If these specialized skills suggest a solution to *your* nuclear problems, call Kellogg's Fabricated Products Sales Division.

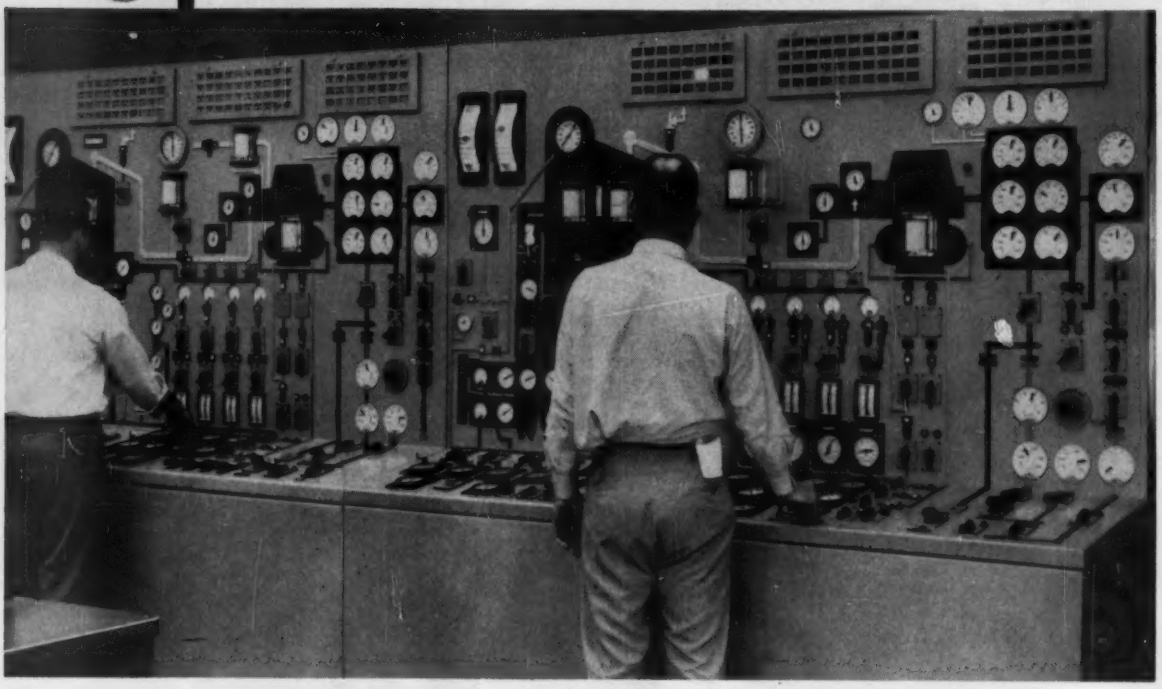
THE M. W. KELLOGG COMPANY, 711 THIRD AVENUE, NEW YORK 17.

A SUBSIDIARY OF PULLMAN INCORPORATED

The Canadian Kellogg Company Limited, Toronto • Kellogg International Corp., London • Kellogg Pan American Corp., New York
Societe Kellogg, Paris • Companhia Kellogg Brazileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas

M W KELLOGG

How Copes-Vulcan control systems boost power plant efficiency



Copes-Vulcan puts combustion control at operator's finger tips

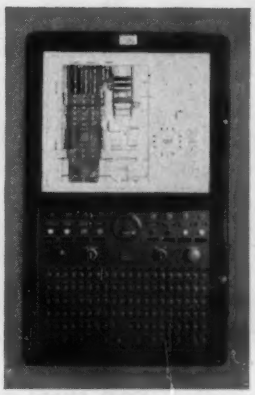
Equipped with easy-to-read recorders and control stations, this compact Copes-Vulcan panel centralizes operator control and simplifies boiler operation. This modern system features circuit simplicity with independent control loops on air flow, fuel loading and furnace draft. Drive units assure accurate positioning and fast response, and eliminate the need for interconnecting control loops.

A custom installation . . . a continuing service

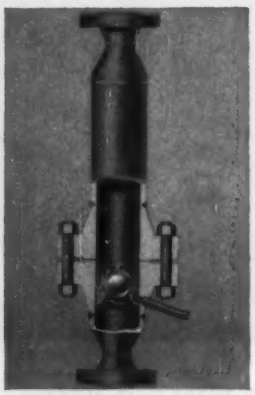
Copes-Vulcan Combustion Control is just part of an integrated boiler control system for regulating feed water, boiler steam temperature and boiler cleaning.

Whether furnished in individual units or integrated into a single system, each installation is tailored to meet specific requirements of generating capacity, load range and fuel. Copes-Vulcan supplies skilled service, when needed, for the life of the installation.

Write for Bulletin 1032 showing a Copes-Vulcan control system working at a showcase generating plant.

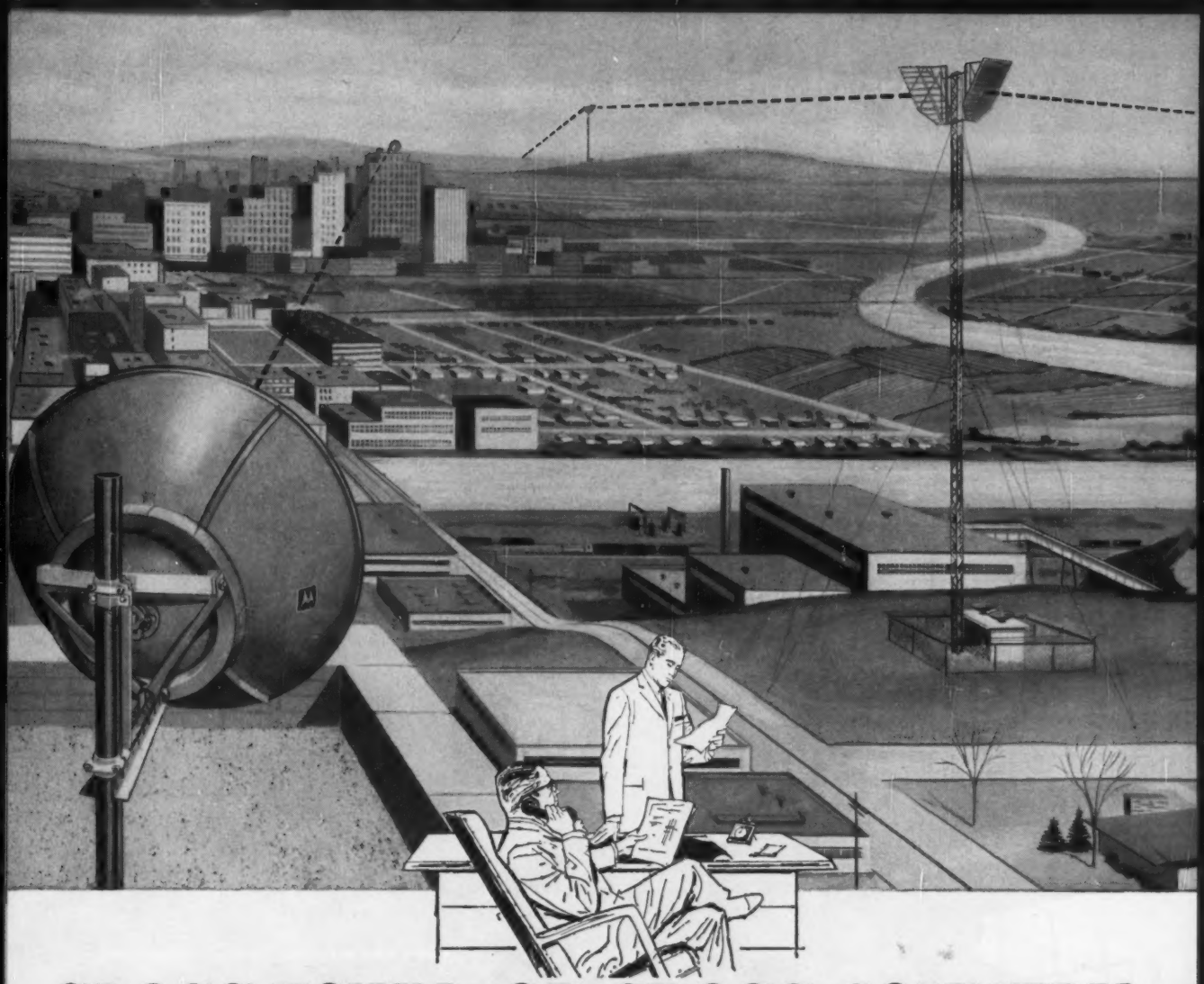


Precision boiler cleaning with Copes-Vulcan Selective-Sequence or Automatic-Sequential soot blowing systems. Space-saving panel permits easy monitoring, flexible programing . . . assures thorough cleaning with less steam and/or air. Write for Bulletin 1029.



Desuperheater improves temperature control. New Variable-Orifice Desuperheater* holds reduced steam temperature constant only 20° downstream from desuperheater outlet, even over a 50-to-1 load range. Write for Bulletin 1037. *Patent applied for

Copes-Vulcan Division
BLAW-KNOX COMPANY
Erie 4, Pennsylvania



CROSS-TOWN...OR CROSS-COUNTRY

Your Motorola Microwave System puts complete, low cost operational control at your fingertips

Here is a communications medium that will return its cost many times over in increased efficiency. This single system will handle all of your control, voice, printed messages and 2-way radio signals.

Motorola Microwave works around-the-clock, fair weather and foul, to speed a thousand tasks a day . . . spanning city streets, rivers and mountains with ease. You get better control, improved coordination and increased efficiency throughout your organization. And with Motorola, you get the benefits of years of experience in serving all types of applications.

Motorola's reputation for dependability with less maintenance is your assurance that you can't buy a better system. Let our representative show you operational records that prove Motorola Microwave performs better, lasts longer and costs less to maintain . . . or write for Microwave Bulletin today.

VOICE
Private line and party line—VHF mobile and base station 2-way radio . . . all can be carried hundreds of miles, economically and privately, by Motorola Microwave.

PRINTED MESSAGES
Read a message, a chart or facsimile a thousand miles away . . . assemble information quickly. Teleprinting, telemetering, telegraph and facsimile are at your command.

CONTROL SIGNALS
Read meters, turn valves, gather and process data from any central location. With Motorola Microwave you can have supervisory and remote control.

MOTOROLA MICROWAVE

Motorola Communications & Electronics, Inc. • A Subsidiary of Motorola, Inc. • 4501 W. Augusta Boulevard, Chicago 51, Illinois

Rotary kilns at Missouri Portland Cement Company.

Missouri Portland Cement meets increasing power needs... provides for future expansion!

In 1949, Missouri Portland Cement Company completed a modern power distribution system to meet its demands for electricity at its Prospect Hill plant. Its main substation provided 12,000 kva of transformer capacity — supplied by two Wagner Power Transformers — which could be raised to 16,000 kva by the use of cooling fans. The system also included five 750 kva load-center unit substations — powered by Wagner Unit Substation Transformers.

Since that time, a need for increased production brought about the installation of a third rotary kiln, and even 16,000 kva was inadequate. This pressing need for more power was met by the addition of a third 6000/8000 kva Wagner Power Transformer, and by the addition of another Wagner Unit Substation Transformer for the load-centers.

Wagner Power and Unit Substation Transformers can meet your power needs just as they do at Missouri Portland Cement Company. Ask your nearby Wagner Sales Engineer to help you plan for your power needs. Call the nearest of our 32 branch offices, or write us.

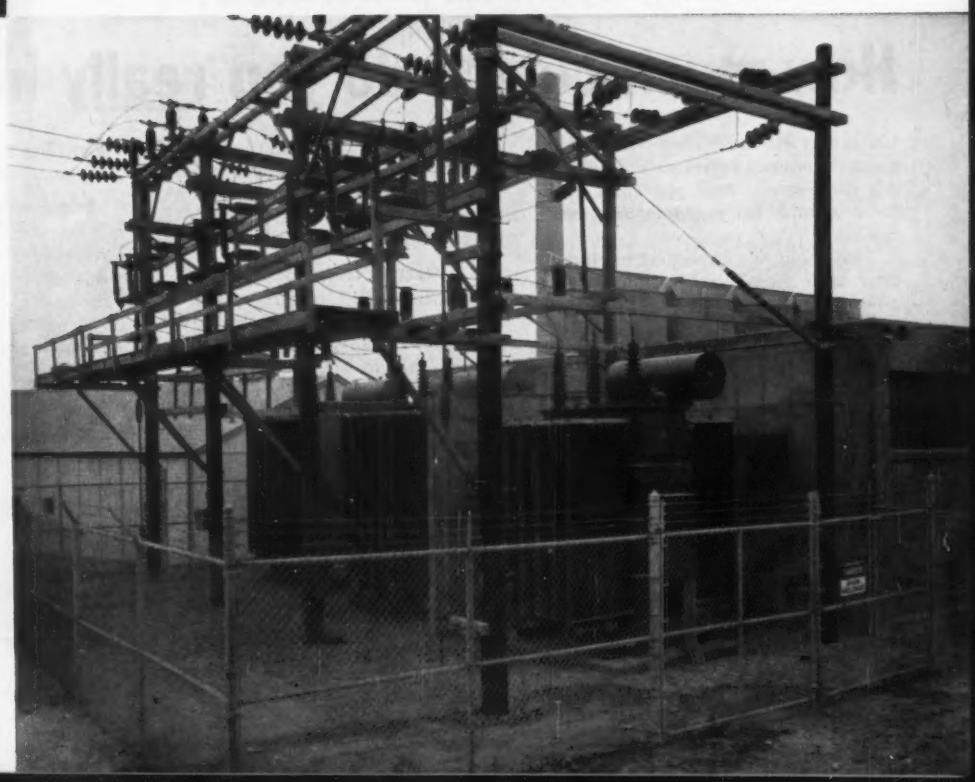
Wagner Electric Corporation

6456 PLYMOUTH AVE., ST. LOUIS 14, MO.

WT 50-5

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Here are two of the Wagner three phase, non-inflammable liquid filled unit substation transformers installed at Prospect Hill. Each is located as close as possible to the load of the particular areas they serve.



Transformer Triplets ...Born 8 Years Apart!

These three Wagner Power Transformers in the main substation at Prospect Hill are identical — although the third unit was built eight years after the first two. They meet the tremendous demand for a dependable flow of power for Missouri Portland Cement Co.

LIVE BETTER ELECTRICALLY

When choosing a premium power cable . . .

How much choice do you <u>really</u> have?

Cable may *look* alike—but you can find many differences in jackets and insulating compounds. And you want only the *best* cable for your operating conditions.

That's why it's important to choose your cable from a manufacturer who offers you a real choice of modern cable materials.

Full choice of insulating compounds

Only three major companies give you a choice of *either* oil-base or butyl-base insulation. Rome Cable is one of these three and offers a choice of Rozone A (butyl-base) and Rozone (oil-base) insulations.

And, in addition, Rome can offer you a *polyethylene* insulation for high voltages.

You can match your operating needs more closely with cable insulation that puts the emphasis on what you want most—resistance to heat, moisture, ozone cutting, or any combination of properties. You can be sure of this choice when the cable is made by Rome Cable.

Getting the right jacket

In modern jacket materials, too, the same kind of freedom works to your advantage. You get a choice, with Rome Cable, of Roseal (special flame-retardant polyethylene); Roprene (a Rome-developed neoprene compound for use with rubber insulations); Rolene (polyethylene); and several other high-quality jacketing compounds. Each has its own advantages, depending on your requirements.

Bring your cable problems to Rome

When you discuss your premium cable requirements with your Rome Cable representative, you can count on his recommending the *right* cable for you. No matter what type of cable you choose, take advantage of Rome's ability to offer you a *real* choice.

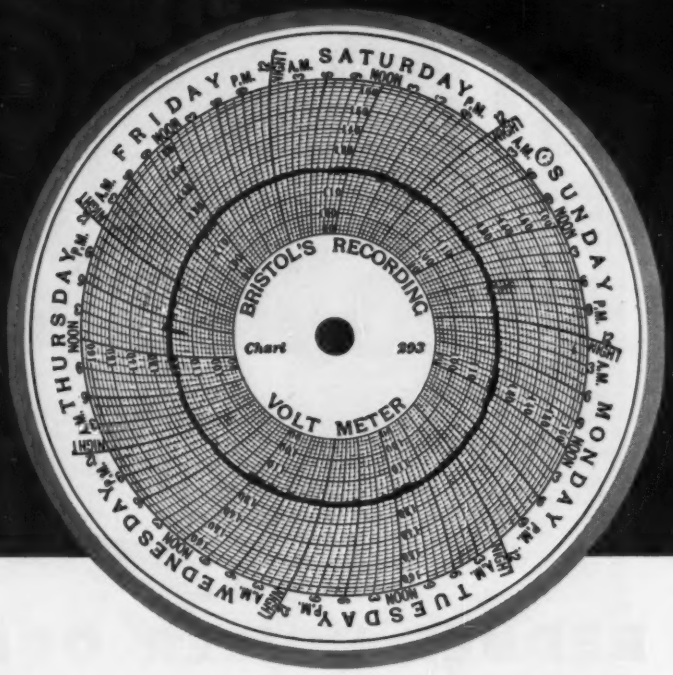
For more information on the choice you get with Rome's power cable, contact him now—or write to Department 713, Rome Cable Corporation, Rome, New York.

ROME CABLE

CORPORATION

ALLIS-CHALMERS . . . 25 years of leadership in 5/8% regulators

2 Volts = $1920* per year



Here's how revenue loss is cut by holding a 2-Volt Band

MANY feeders are averaging high voltages during low load periods with low voltages during high load periods. The average may look good on paper. *But the result is a net loss of revenue!*

Regulating within a narrow 2-volt band width increases effective voltage, especially during the time of greatest load without changing the *average* voltage.

Each 1-volt increase in effective voltage increases revenue $960 on average feeder. Allis-Chalmers 5/8% step regulators hold a narrow band width of ±3/4 volt.

For the complete story, call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

*** Based on following factors:**

Peak demand — 2000 kw . . . Average demand — 800 kw . . . Annual load factor — 40% . . . Percent lighting and manually controlled heating — 30% . . . Value of kwhr — 3.4¢ . . . Power consumption varies as 1.6 power of applied voltage.

Originators of 5/8% Step Regulators

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5727

This is the latest in precise, adjustable speed control for draft fans and BF pumps!

E-M standard construction for most indoor applications.

REDUCE BOILER OPERATION COSTS

with one of the four *new* E-M ADJUSTABLE SPEED MAGNETIC DRIVES

- **More power in less space**
- **Simpler installation**
- **Better, quieter cooling**
- **Lower maintenance**

E-M Magnetic Drives help you reduce costs of auxiliary drive power and maintenance. Here's how:

LOWER POWER COSTS by eliminating need for wasteful throttling of boiler feedwater pumps and draft fans. Magnetic Drives *control speed* for efficient operation of auxiliaries.

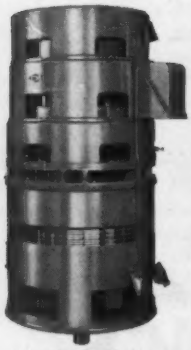
MINIMIZE FAN EROSION by operating fans at speeds to fit boiler combustion demands.

HAVE FAST RESPONSE to improve combustion and cut down thermal losses.

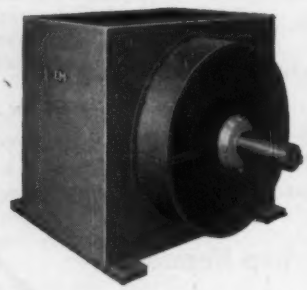
GIVE ACCURATE SPEED CONTROL. "Regutron" Control is responsive to *speed* of driven equipment regardless of changes in operating conditions. "Magnetic action" gives ±½% sensitivity. Anti-hunt and damping circuits assure stable operation.

OFFER BROAD SPEED RANGE. A large number of speed steps gives virtually stepless speed control . . . lets you select and keep exact speed.

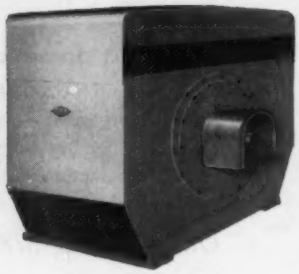
Write E-M for literature, or call your nearby E-M Field Engineer. He'll be glad to tell you first-hand all about the new developments in E-M Magnetic Drives.



Vertical E-M Magnetic Drive and Motor.



Top air discharge type for larger high speed ratings. Heat can be ducted away.



Weather-protected outdoor design. Screened intakes at feet, discharge near top.

E-M

4400-TPA-2175

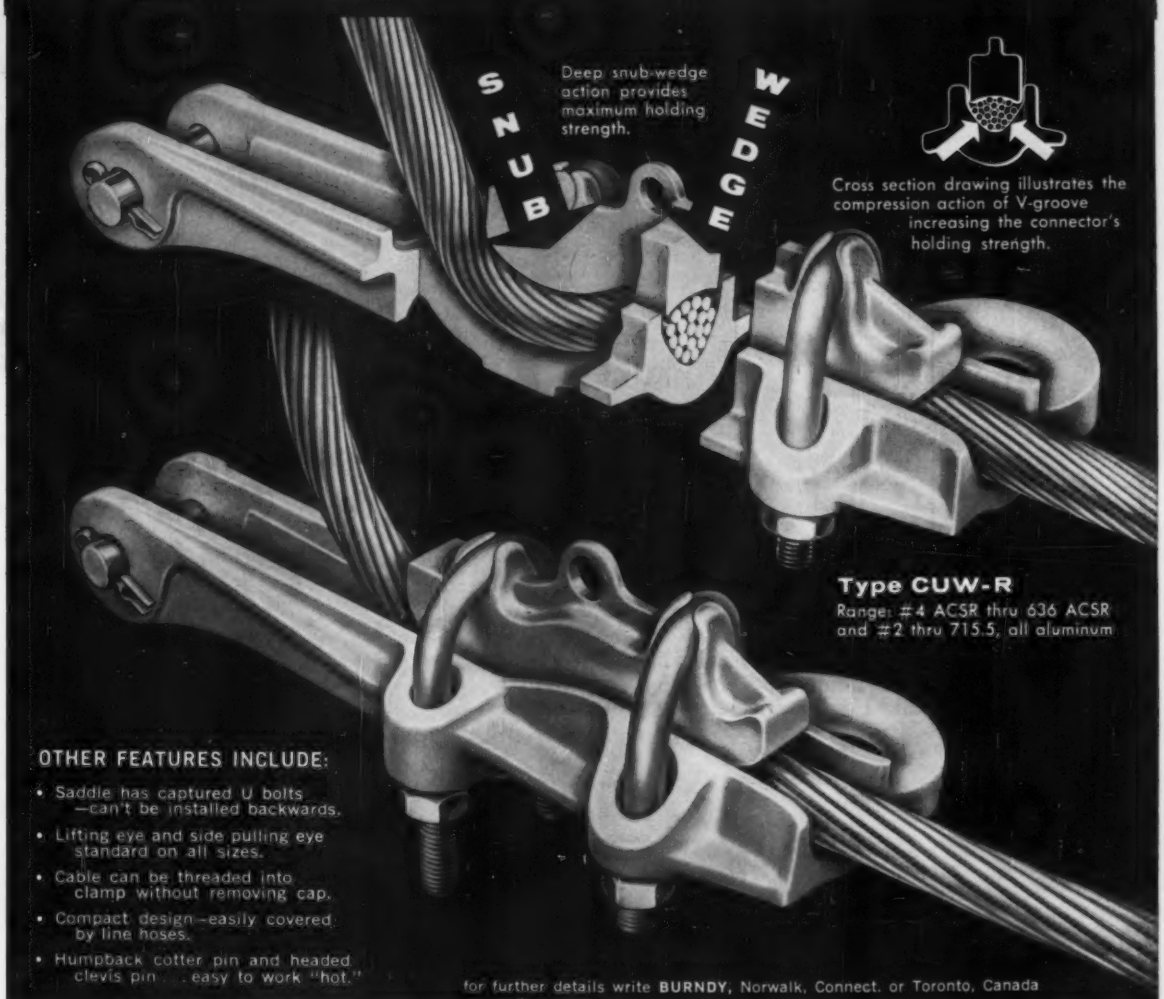
ELECTRIC MACHINERY MFG. COMPANY

Minneapolis 13, Minnesota

Specialists in making drives do **EXACTLY WHAT YOU WANT THEM TO**

get the inside story on this aluminum

DOUBLE ACTION
LOW COST
DEAD END CLAMP


SNUB
WEDGE
Deep snub-wedge action provides maximum holding strength.
Cross section drawing illustrates the compression action of V-groove increasing the connector's holding strength.

Type CUW-R
Range: #4 ACSR thru 636 ACSR and #2 thru 715.5, all aluminum

OTHER FEATURES INCLUDE:

- Saddle has captured U bolts —can't be installed backwards.
- Lifting eye and side pulling eye standard on all sizes.
- Cable can be threaded into clamp without removing cap.
- Compact design—easily covered by line hoses.
- Humpback cotter pin and headed clevis pin . . . easy to work "hot."

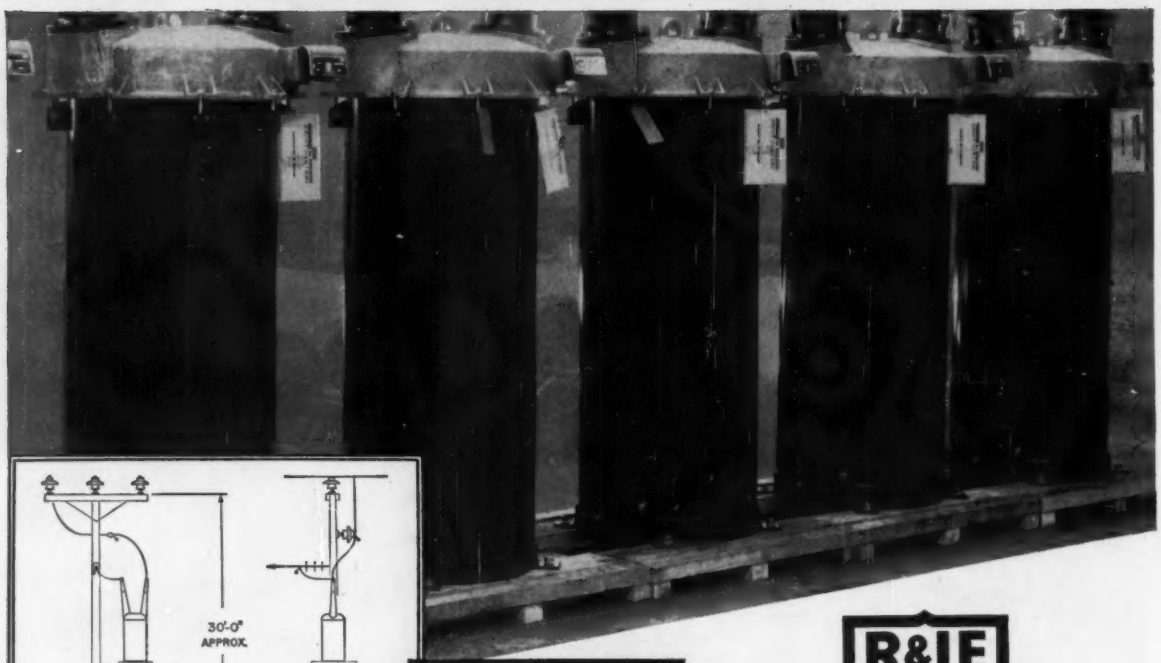
for further details write **BURNDY**, Norwalk, Connect. or Toronto, Canada

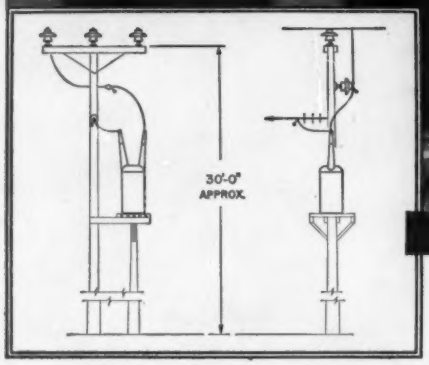
BURNDY

58-7

NEW *for* 34.5-46 Kv DISTRIBUTION

or LOW-COST AUTOMATIC PROTECTION for SUB-TRANSMISSION





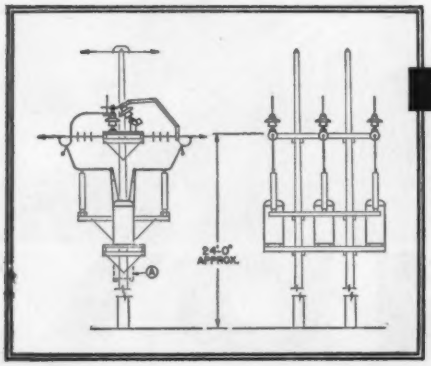
STUB POLE MOUNTING

For single phase lines, or span-spaced along three phase lines.

R&IE

2 cycle

Simple type HVR installations plus low first cost—as compared with circuit breakers—offer, for the first time, economical automatic recloser protection for 34.5 and 46 Kv circuits.

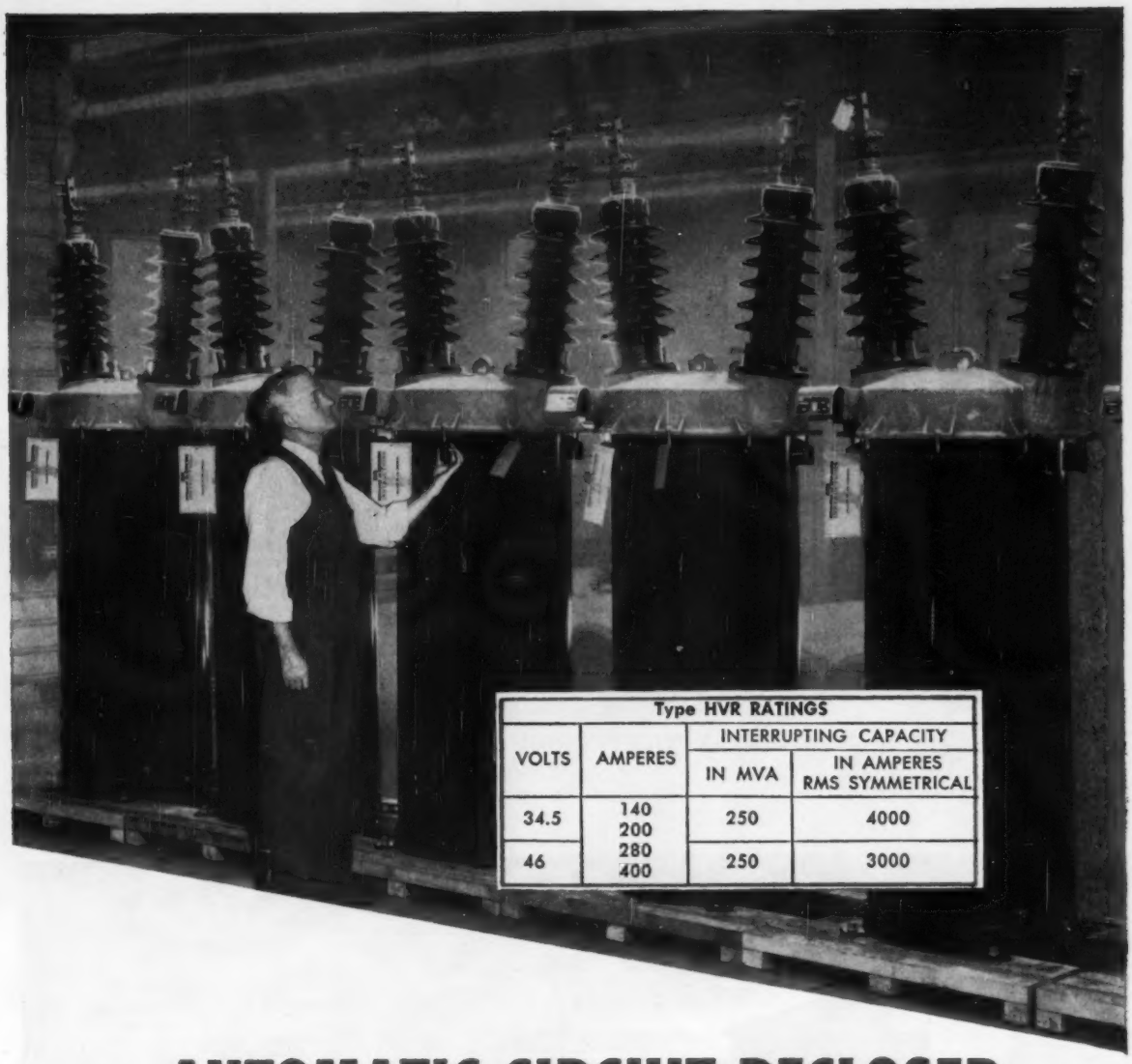


POLE LINE RIGHT OF WAY

Compact H-frame mounting for 3-pole installation, with bypass and disconnect switches, and lightning arresters.

(A) Recloser in this position has been rotated 90 degrees, for convenience and easy removal or installation.

• *Consult your I-T-E representative*



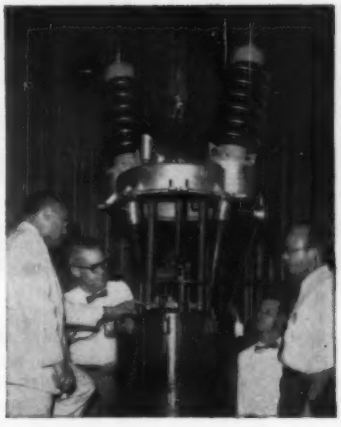
Type HVR RATINGS			
VOLTS	AMPERES	INTERRUPTING CAPACITY	
		IN MVA	IN AMPERES RMS SYMMETRICAL
34.5	140 200	250	4000
46	280 400	250	3000

. . . AUTOMATIC CIRCUIT RECLOSER

provides economical automatic protection

- Clears damaging faults in 2 cycles
- Restores service in 25 cycles

"Experience has shown that 70% to 95% of all high-voltage transmission-, subtransmission-, and distribution-line faults are non-persisting *if the fault current is quickly disconnected from the system*" . . . (Ref.—"Faster Reclosing Breakers Needed," by J. T. Logan, E. W. No. 103).



for more information—Test data available on request. . . . . . .

I-T-E CIRCUIT BREAKER COMPANY
R&IE EQUIPMENT DIVISION · Greensburg, Pa.

750 MCM Single Conductor 91 Strands, 5KV Shielded SUPER-PARARITE PARAPRENE CABLE

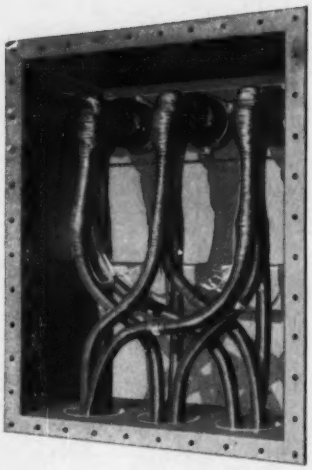
PARANITE®

SUPER-PARARITE® PARAPRENE®

CABLE

Installed at Turkey Creek

Here's another example of power—Paranite—and American industry . . . the selection of Super-Pararite Paraprene Cable for the new Turkey Creek Pumping Station at Kansas City, Missouri. The Super-Pararite butyl conductor insulation is recognized for superior resistance to heat, cold, moisture, oxidation and ozone, while the Paraprene neoprene jacket possesses inherent resistance to sunlight, abrasion, ozone, heat, oil and chemicals . . . one of many Paranite products which has earned the industry reputation—"IF IT'S PARANITE IT'S RIGHT."®



PARANITE WIRE AND CABLE DIVISION

Essex Wire Corporation, Fort Wayne 6, Indiana

MANUFACTURING PLANTS: Birmingham, Ala.; Anaheim, Calif.; Jonesboro, Ind.; Marion, Ind.; Tiffin, Ohio

Sales Offices in all Principal Cities

The huge riverside crane at Combustion's Chattanooga Division, capable of lifting loads in excess of 250 tons, is about to ease the reactor vessel into a 195-ft. barge which will transport it via the Tennessee and Ohio Rivers to Cincinnati. From there it will travel by rail to the Enrico Fermi Atomic Power Plant at Lagoona Beach, Michigan — 30 miles below Detroit.

AMERICA'S LARGEST NUCLEAR COMPONENT

The nuclear reactor vessel shown here is the most remarkable stainless steel pressure vessel ever built. This 36-foot, 92-ton giant is the container for the nuclear furnace that will power the world's first full-scale, fast-breeder reactor power plant — the Enrico Fermi Atomic Power Plant. Designed by Atomic Power Development Associates, Inc., the nuclear section of this plant will be owned by Power Reactor Development Co., and the turbine-generator section by Detroit Edison Co.

Because of its vast size and complexity, the reactor vessel presented unique problems of design and fabrication. In reality, it comprises four separate cylindrical vessels welded together to form a single unit assembly, plus a large amount of internal shielding the fabrication of which involved the use of 65,000 square feet of stainless steel — all constructed and assembled with a precision never before attempted in work of this size and character. Additional parts of the vessel, scheduled for later shipment, will bring its total weight to about 200 tons.

No more than two or three plants in the world presently have the skills and facilities even to undertake the production of work of this kind. Combustion not only has the men and machines, but also the experience to produce such reactor vessels. Moreover, it is equipped and qualified to design and manufacture all other major components of complete nuclear power systems.

The Enrico Fermi Plant exemplifies the continuing, urgent drive by electric utility companies to generate electricity at the lowest possible cost, utilizing all developments modern science and technology can produce. Combustion is proud to have shared in this major step of the power industry to prepare itself for the age of the atom.

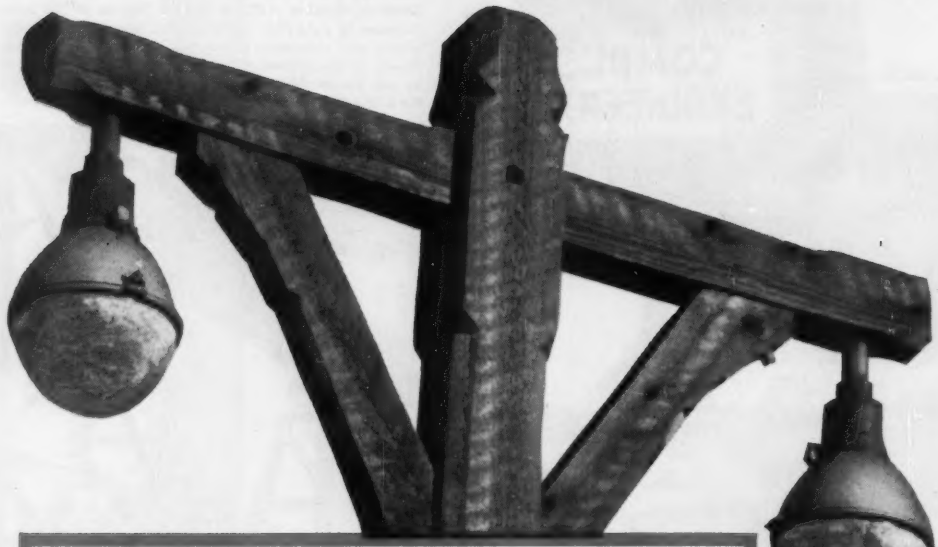
COMBUSTION ENGINEERING

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

C-E

C-158

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE



WHAT'S *Up* IN WOOD PRESERVATIVES?

PENTA TREATMENT!

It's Cleaner, Protects Better And Costs No More

Take your pick of *three* important reasons why you should preserve wood with PENTA treatment! Any *one* of them should cinch the matter.

1. Costs no more – Service records show PENTA treatment gives poles, cross ties and other lumber for exposed structure extra long life. Yet PENTA treatment costs no more than ordinary preservatives.

2. Won't leach out – Because PENTA is an oil-borne rather than water-soluble preservative, it doesn't leach out, leaving wood vulnerable to rot and termites.

3. Clean to handle – Construction and maintenance supervisors know that workmen handle clean wood faster, more efficiently – and with fewer kicks!

Reichhold is a major supplier of PENTA to the wood industry and to wood users. If you haven't done so yet, investigate this modern method of protecting your lumber investments – write for the name of your nearest Reichhold distributor of PENTA.

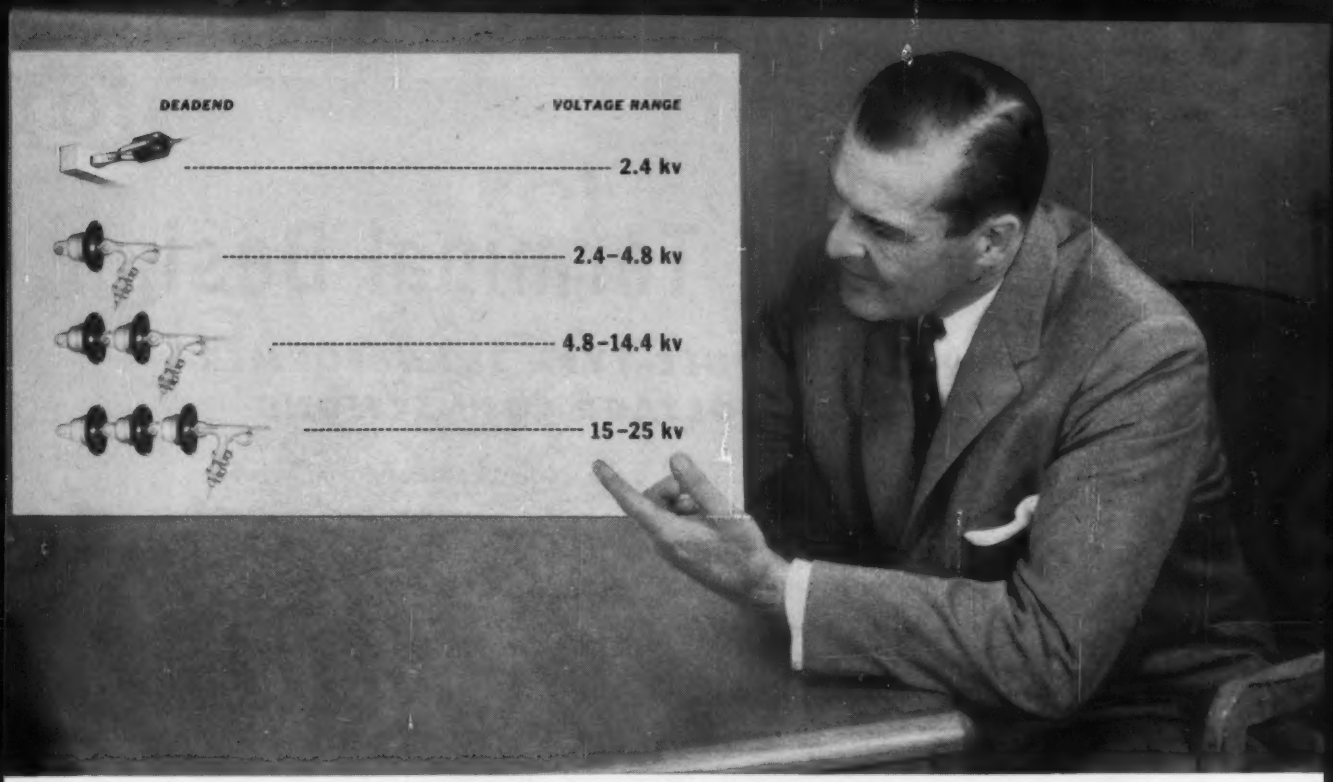
Creative Chemistry . . .
Your Partner in Progress

RCI

REICHHOLD

Synthetic Resins • Chemical Colors • Industrial Adhesives • Phenol
Hydrochloric Acid • Formaldehyde • Glycerine • Phthalic Anhydride
Maleic Anhydride • Sebacic Acid • Ortho-Phenylphenol • Sodium Sulfite
Pentaerythritol • Pentachlorophenol • Sodium Pentachlorophenol
Sulfuric Acid • Methanol

REICHHOLD CHEMICALS, INC.,
RCI BUILDING, WHITE PLAINS, N.Y.



What Does a "BOLD LOOK" at Tomorrow's Distribution Voltages Show You?

VOLTAGES CAN GO IN ONLY ONE DIRECTION . . . UP

"Take a Bold Look at Distribution" says a headline in one of the power industry's leading magazines.

Have you taken your "bold look" and if you have, what does it show? You know what the residential customers are doing. They're buying ranges, clothes dryers, air conditioners and other "Live Better . . . Electrically" appliances in large quantities.

By 1970 there will be sixty-four million residential customers using 8000 kwhr each annually, according to present forecasts. No wonder many far-sighted distribution engineers are talking about primary residential distribution at a voltage two to four times as high as their present system voltage.

You alone know how high you should go. All we want to do is urge you to make adequate allowance for future loads and to point out that installing extra insulation at deadends now will make raising voltages that much easier tomorrow. If provision can be made for existing conductors to serve four to 16 times their present loads, major construction costs can be saved.

We also suggest that the insulators to use are O-B, supplied by Graybar.

OHIO BRASS COMPANY, MANSFIELD, OHIO

LIVE BETTER ELECTRICALLY

Ohio Brass

Distributed by GRAYBAR ELECTRIC COMPANY

4866-M

NOW! One Terminal Design

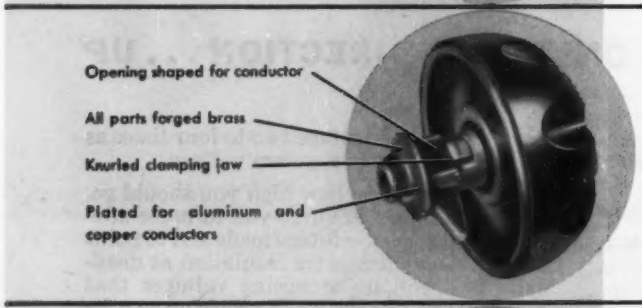
FOR ALL POLE-TYPE TRANSFORMER HIGH VOLTAGE CONNECTIONS

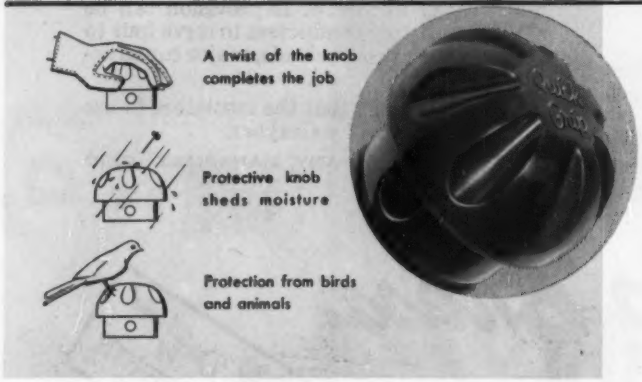
"Quick-Grip" insulated high voltage terminals are standard on all Kuhlman pole-type transformers at no extra cost.

The "Quick-Grip" terminal is by no means new to the industry. First introduced by Kuhlman in 1939, it is universally used today as the fastest, most convenient method for making sidewall line connections. Now Kuhlman, exclusively, offers the same feature in cover mounted designs.

Two years of field service and customer acceptance have proven "Quick-Grip's" versatility in meeting all pole-type transformer high voltage requirements. Here, basically, is how this feature gives all around service and protection for both sidewall and cover mounted bushings.

Electrode opening provides an open discharge path to ground
Sidewall "Quick-Grip" with arresters added
Cover mounted "Quick-Grip" with arresters added





Built-in Electrode

When arresters are mounted on the transformer, "Quick-Grip's" built-in electrode forms a discharge gap to the arrester terminal. When arresters are not physically mounted on the transformer, the electrode can spill over any abnormal discharges to ground without damage to the bushing, assembly, or knob.

Accommodates Aluminum or Copper Conductors

The terminal conductor opening is shaped to minimize cable deformation and provide maximum contact surface. Knurled clamping jaw applies a firm clamp on either solid or stranded wire and compensates for any relaxation in conductor stresses.

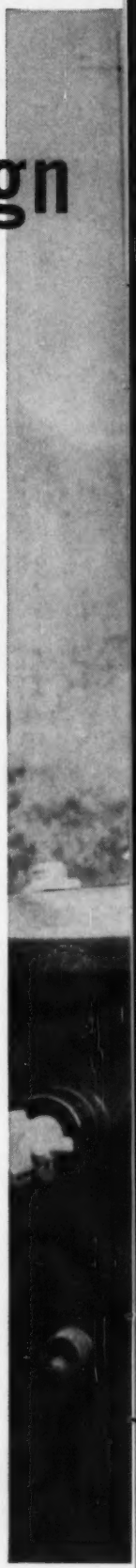
All parts are forged brass to assure greater strength. Clamping parts are plated to eliminate harmful oxidation.

Both cover and sidewall mounted designs accommodate either copper or aluminum conductors.

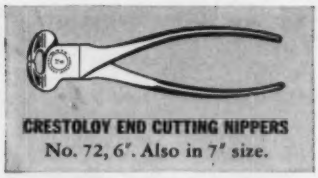
Greater Convenience, More Protection

The big convenient hand grip provides an easy, quick means for connecting the line without tools. A permanent connection is simply made by hand-tightening the knob.

The knob's oversize overhang umbrellas the terminal assembly, sheds water, and keeps dirt and moisture away from the terminal parts. It serves as an insulator as well and eliminates accidental outages or flashovers caused by birds and animals coming in contact with the terminals.



KUHLMAN ELECTRIC COMPANY
General Offices: Birmingham, Michigan
BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

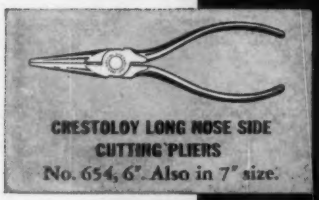


CRESTOLOY END CUTTING NIPPERS
No. 72, 6". Also in 7" size.

Each and every CRESTOLOY PLIER *is individually tested!*

CRESTOLOY HEAVY DIAGONAL CUTTING PLIERS
No. 542, 7" size only.

CRESTOLOY LINEMENS' SIDE CUTTING PLIERS
No. 1950, 8". Also in 6" and 7" sizes.



CRESTOLOY LONG NOSE SIDE CUTTING PLIERS
No. 654, 6". Also in 7" size.

This Plier is made of CRESTOLOY STEEL and has tested 100% satisfactorily

CRESTOLOY DIAGONAL CUTTING PLIERS
No. 942, 6". Also in 4" and 5" sizes.

When you choose a CRESTOLOY PLIER you know you are getting top value and proven performance. After rigorous factory testing for ease of cutting, hardness of blades and strength, each tool that passes these tests is tagged with the certifying tag reproduced above. CRESTOLOY PLIERS are available in more than a score of patterns including the five popular types illustrated.

CRESCENT and CRESTOLOY TOOLS are sold by hardware dealers and industrial distributors everywhere. Look for the bright yellow Crescent Display panels and select from one of the world's greatest assortments of quality hand tools.

CRESCENT TOOLS
Give Wings to Work
Sign of the Artisan
Symbol of Excellence ®

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

40-Fan-Cell Double-Flow® Cooling Towers at Clinch River Station

These four 10-cell towers have built-in ability to resist the greatest hazard to cooling tower service — **FUNGAL DECAY.** The 1,715,000 board feet of lumber used in their construction will set a new standard of durability, for every foot of it was **MARLITH** pressure protected after fabrication.

It is only logical that the organization that envisioned, engineered and constructed this newest and greatest mine-mouth power facility should recognize this hazard and take steps to prevent its destructive action. By doing so they have assured for the future adequate cold water at efficient operating temperature, and this is just as important to power production as is fuel supply.

This plant is destined to build a new economy for an undeveloped area — a long range project — so its plan includes all the soundly-based advances that modern technology offers for plant longevity. **MARLITH** treatment has an important role in this program of continued performance for it means that accumulated maintenance costs over the years will be low by any comparison with unprotected cooling towers.

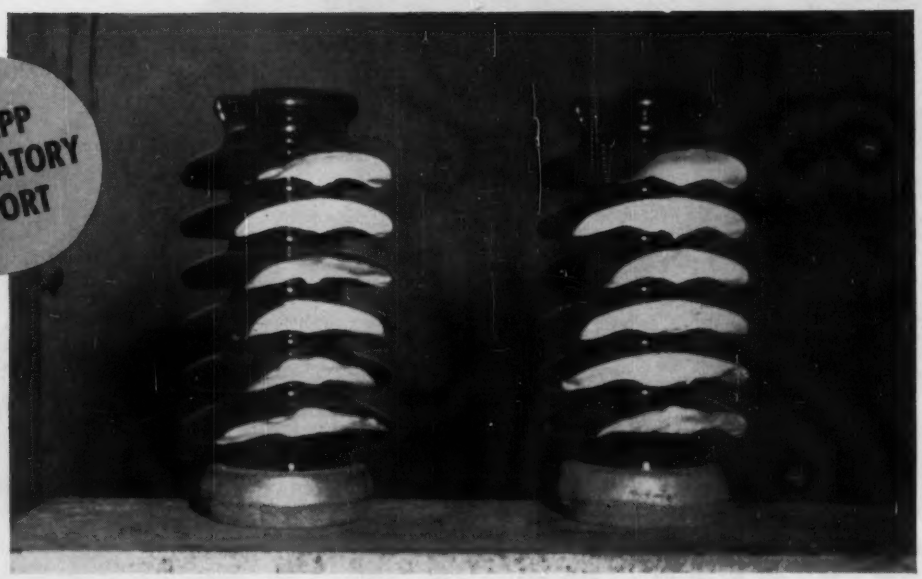
If water conservation is in your development plans (it's good business for you, your neighbor, your nation), you'll find it profitable to get full information from your Marley engineer on MARLITH—the "life insurance" for cooling towers. Ask or write for Marlith Bulletin—M-58.

MARLITH is a registered trade name of the

The Marley Company Kansas City, Missouri

MARLEY®

A LAPP LABORATORY REPORT



BROKEN CORRUGATIONS...

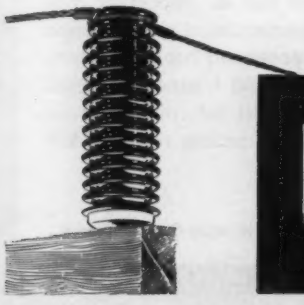
how do they affect performance?

THE PROBLEM: It is well known that mechanical damage to the Lapp Line Post insulator causes much less loss of its electrical characteristics than does such damage to pin-type or suspension insulators. Good maintenance on a system generally does call, however, for changing out insulators that show sign of damage. How urgent is it to replace insulators reported as being damaged? The answer, of course, involves security of the system as well as economy of maintenance, and can be found only in evaluation of characteristics.

THE TEST: Utility engineers whose company operates a large system on Lapp Line Posts wished to set a standard procedure for Line Post maintenance. They visited the Lapp plant and had us make laboratory tests of 35 kv Lapp Line Posts, measuring dry and wet flashover value with petticoats progressively broken off. (We used a hammer to simulate mechanical damage in the field.)

THE FINDING: With the top petticoat broken off, dry flashover was reduced less than 1%, wet flashover by slightly less than 4%. With all six petticoats gone (as shown in the photo) flashover tests showed a loss of 7% in both dry and wet 60-cycle flashover. (In a similar test made previously, we found loss of all corrugations reducing wet flashover somewhat more—apparently the exact pattern of the break has an important effect.)

THE CONCLUSION: The strong post body of the Lapp Line Post remains intact, and an insulator with all petticoats broken will handle normal operating conditions. Loss of one or two corrugations poses no urgency whatsoever. The company for whom this test was made will replace insulators so damaged only when convenient.



Lapp

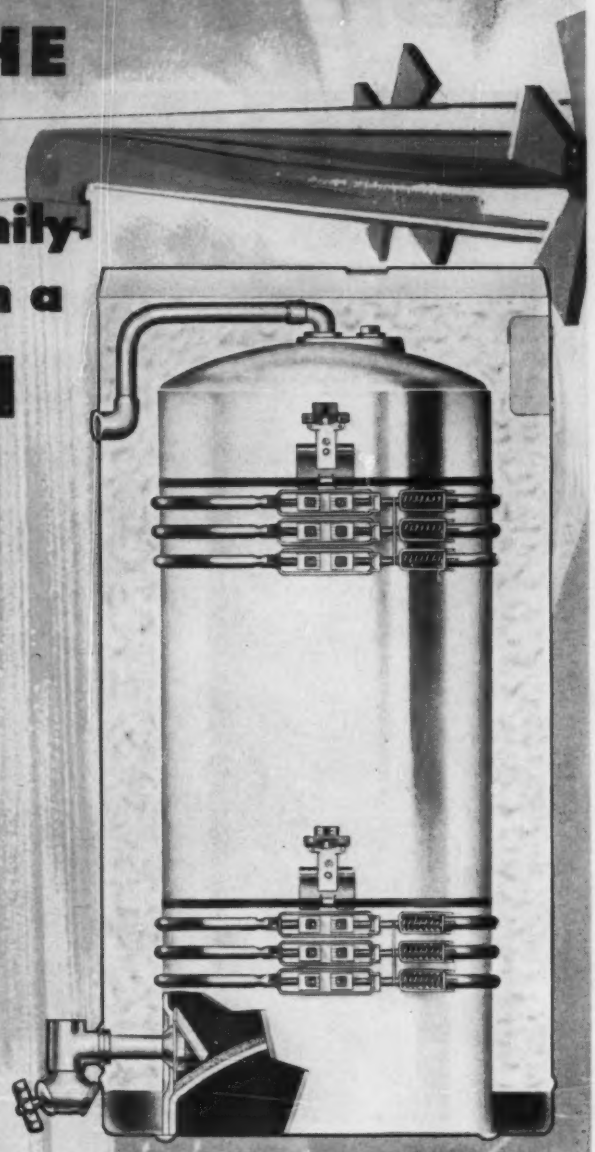
THE MORAL: Use Lapp Line Posts on your system for distribution and subtransmission up to 88 kv. They'll give you an extra margin of operating security, low maintenance cost and long life.

Lapp Insulator Co., Inc., LeRoy, N. Y.

NOW—ALL THE HOT WATER

that any normal family will ever want—from a

40-GALLON TANK!



New Hotpoint SUPER-SPEED Water Heaters are *RIGHT* for 95% of your customers.

Here's tremendous hot water production in a bare minimum of space. Calrod® Magic Circle heat delivers 470 gallons of hot water every 24 hours... and it will raise 18 gallons 100° in just one hour. Even from a cold start, it will heat water for 3 shower baths in 25 minutes.

Hotpoint Quick-Recovery Water Heaters save space and simplify installation. And the new miracle MLC-7 additive in Perma-Seal models can increase the life of the tank by 200%!

SUPER-SPEED Water Heaters will help you put more POWER in "House-Power"—more LIVING in "Live Better . . . Electrically!"

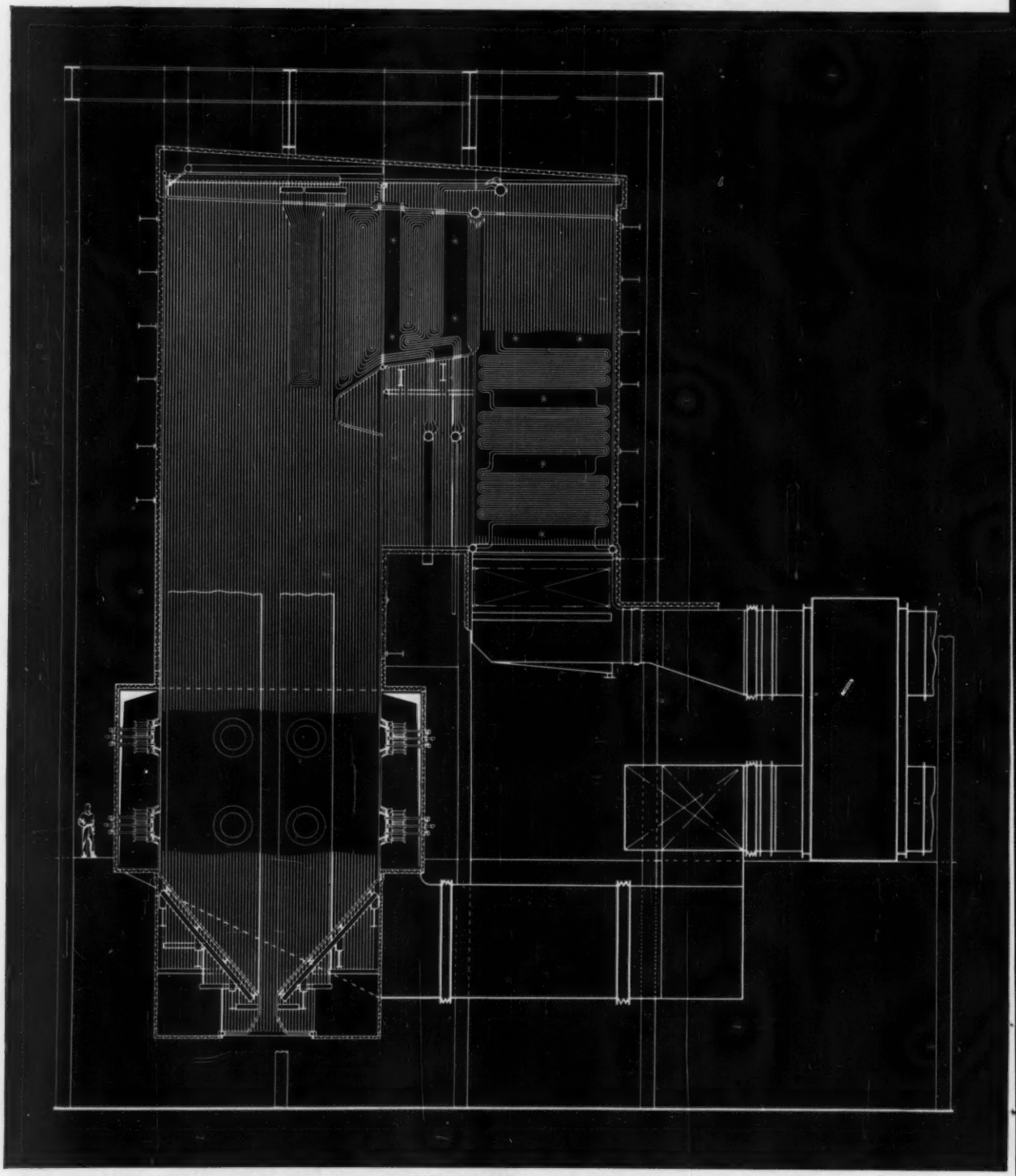
Hotpoint

LOOK FOR THAT DIFFERENCE! (your customers do!)

HOTPOINT CO. (A Division of General Electric Company), CHICAGO 44, ILLINOIS

ELECTRIC RANGES • REFRIGERATORS • AUTOMATIC WASHERS • CLOTHES DRYERS • COMBINATION WASHER-DRYERS
CUSTOMLINE • DISHWASHERS • DISPOSALLS® • WATER HEATERS • FOOD FREEZERS • AIR CONDITIONERS • TELEVISION

A Big Step Forward-



Newest UP unit for Southern California Edison will provide steam at a rate of 1,638,000 lb per hour to a 210,000 kw turbine at a pressure of 2,400 psi and at a temperature of 1,050/1,000 F. Completion of the unit, which will burn either natural gas or oil, is scheduled for November, 1960.

Why Southern California Edison Purchased B&W Universal Pressure Boiler for 2400 PSI Operation

Once-Through Unit Reduces Capital and Operating Costs —Makes Use of Variable Pressure Possible

A big forward step in holding the line on the cost of producing electricity was taken by Southern California Edison in purchasing two B&W Universal Pressure units for its station at Huntington Beach, California.

Solid savings both in installed first cost and in operation stand behind this decision. Here are the facts:

INSTALLED COST

1. The overall cost of a Universal Pressure Boiler represents a saving over a drum type boiler for identical conditions.
2. Because height and weight of the UP Boiler are much less than those of drum type boilers, there are worthwhile savings in building and construction costs.
3. Superheat, hot reheat and cold reheat steam piping are reduced.
4. Foundation costs reduced because of 650 ton saving in weight of unit.
5. Drum transporting and lifting costs eliminated.
6. One level of stairs, walkways and elevator landing eliminated.

OPERATION

Many significant advantages from the UP's unique operating features helped shape Southern California Edison's decision. Here is what they found:

1. Constant steam temperature at all loads without use of tempering equipment.
2. Rapid response to load change.
3. Quick start up and shut down.
4. Simplified control system during normal operation.
5. Minimized operating complications when turbine is tripped.
6. Complete flushing of preboiler and boiler system is accomplished during every start up and shut down.
7. Reduced dependence on safety valves.
8. Elimination of water level gauge glasses and indicators.
9. Ease of acid cleaning.

VARIABLE PRESSURE OPERATION

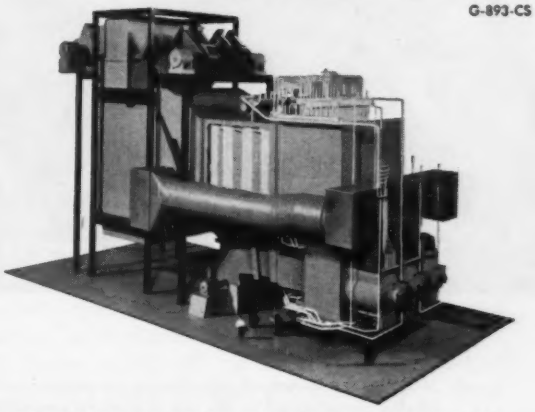
The Universal Pressure Boiler can be operated with variable pressures and constant steam temperature over a wide load range. This not only means more efficient operation at partial loads, but also cuts auxiliary power requirements at lower loads.

The Universal Pressure Boiler helps the utilities' pressing need to hold the line on most of the important factors affecting cost of power generation.

Behind its many benefits stands the concrete performance of America's first successful commercial application of the Universal Pressure principle at the Philo Plant of the Ohio Power Company on the American Electric Power System. This unit has had a full year of performance under diversified conditions. Performance, ease of operation and freedom from major troubles have exceeded even the optimum original expectations.

We would be glad to discuss with you the advantages that the Universal Pressure Boiler can bring to your plant. Write to The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

G-893-CS

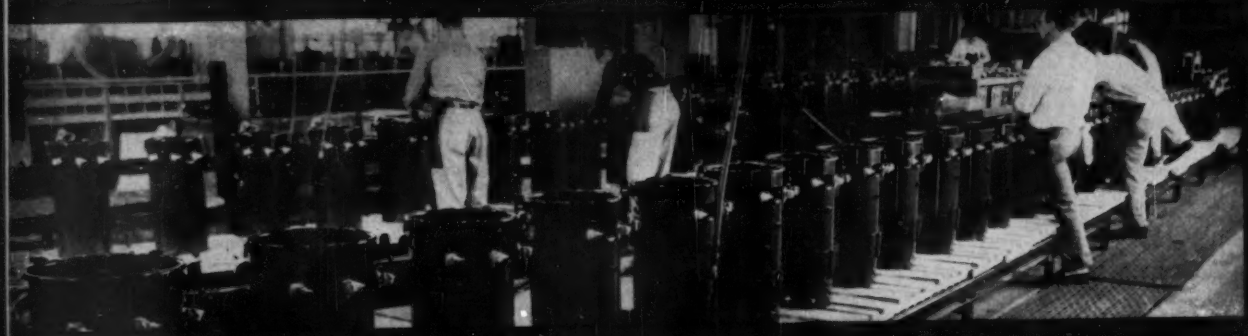


Model of the first Universal Pressure Boiler, which is now operating, uses once-through principle by which water, under pressure, is forced in one end of the system and emerges at the other end as superheated steam. This principle eliminates need for a drum.

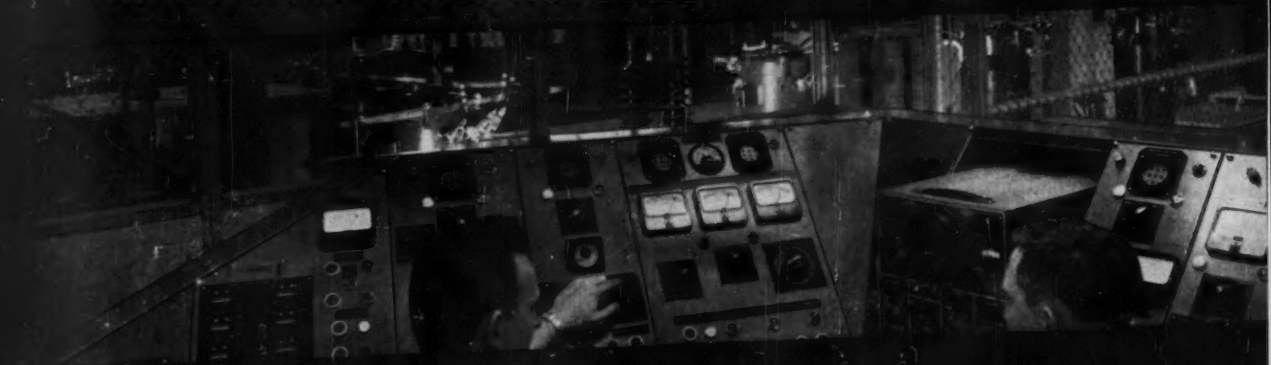
BABCOCK & WILCOX

BOILER DIVISION

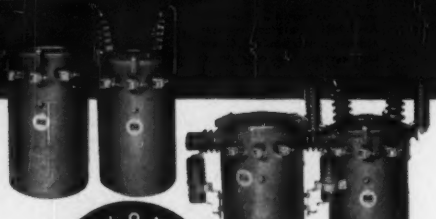
MOLONEY DISTRIBUTION TRANSFORMERS...



SKILLFULLY MANUFACTURED



THOROUGHLY TESTED



Moloney manufactures distribution transformers with increased efficiency and speed by the use of modern assembly techniques. Assembly line methods increase Moloney's capacity, but mass production methods do not cut Moloney quality. Moloney built its reputation with engineering skill, quality materials, and craftsmanship; and these qualities are still the mark of Moloney equipment.

Distribution transformers are tested by an automatic test system to assure that every unit meets not only EEI-NEMA Standards but Moloney's own high standards.

Specify the equipment that is designed, built, and tested for dependable performance under all operating conditions. *Make it Moloney all along the line.*

MESS-9

MOLONEY ELECTRIC COMPANY

Manfacturers of Transformers for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

Editorial Comment

MAY 19, 1958

What's the Best Way to Compare Power Plants?

The answer to this question is pertinent, especially today when the advent of nuclear power has made cost estimates one of the most important aspects of the utility business. Certainly heat rate, fuel cost, capital cost, and total energy cost of power produced from a given station or unit are criteria that have merit. But these traditional bench marks are not without shortcomings.

Heat rate is a good measure of thermal efficiency but by using this measure of performance the deck is stacked against the oil and gas fired plants. You will never find them in the list of the most efficient plants in the country because they are saddled with the hydrogen content of the fuel when it comes to measuring heat rate. This can account for a difference of 500 Btu per kwhr.

Low fuel costs, expressed in mills per kwhr, may very well be the result of favorable location rather than operating and design skill. The same can be said about plant investment costs. We have noted in our cost survey outdoor gas-fired plants built for as little as $70 per kw and indoor coal fired plants of equal capacity built for $170 per kw or more.

And some engineers are critical of the available statistics on power plant costs because they are given on a plant basis. Whereas generating capacity is installed in units. But then, again, reporting on a unit basis would entail a certain amount of mathematical gymnastics due to the fact that certain components of power plants are installed on a plant basis.

How then should power plants be compared? Frankly we can't answer our own question. But perhaps the experts can offer a new set of criteria that will reduce the factors that power plant designers and operators can not control.

Utility Earnings Are Holding Up Well

Operating revenues of 34 electric utility companies reporting to Electrical World totaled $828,598,390 for the first quarter of 1958 as compared with $779,509,844 for the like 1957 period. This is an increase of $49,088,546, or 6.30%. Three companies, Detroit Edison Co, Kansas City Power & Light Co, and Washington Water Power Co showed a decrease in operating revenues under those reported in 1957 due to special circumstances.

Net income of these 34 companies in 22 states amounted to $127,509,879 for the first three months of 1958 as compared with $117,253,979 in the like 1957 period. The increase was $10,255,900, or 8.74%. These companies had net incomes for the first 1958 quarter below those of 1957: Bangor Hydro-Electric Co, Detroit Edison Co, Lake Superior District Power Co, Missouri Utilities Co, Ohio Edison Co, Public Service Electric & Gas Co, Public Service Co of New Hampshire, Southwestern Gas & Electric Co, and Western Massachusetts Electric Co.

Overall this is an outstanding record for an industry. This earning capacity in a period of recession is ample proof of the managerial skill of the utility and consulting engineers and other executives. It provides an answer to those who have worried about the continuing expansion program that is going ahead at record rates in spite of the business climate. It provides ample justification for those who placed their money in these "defensive" utility issues.

Although the gain in earnings may very well be lower in the second quarter than in the first, the difference could be very small. And for the year as a whole, we look for good reports. This should give renewed confidence to all those interested in the electric utility industry from within and without.

Sparked by ideas of this trio* . . .

and bolstered by broad backing . . .

'Better Buy Now' Program Probes

The unlikely sounding Wisconsin communities of Neenah, Menasha, Kimberly, Kaukauna, Little Chute, and Combined Locks may become new bywords for the sales-minded appliance men of the electric industry. Known as the Fox Cities area, these small towns are clustered near Appleton, Wis., on which hopeful eyes have been focused from May 7-17.

The ten-day period saw a test run on what many people on the scene believed could be the forerunner of the nation's greatest appliance promotion activity. Billed as the "Best Appliance Values—Better Buy Now," the program was conceived and planned only a few weeks earlier through the efforts of the trio above.

The "Auto Buy Now" approach by the auto industry was then nearing a successful conclusion.

"Why can't we do something to get the appliance business off the ground?" was the question that followed while Harold Austin and Ken Davis discussed the business outlook. Austin, who represented the General Electric Co distributor, and newspaperman Davis of the Appleton Post-Crescent drew John McLean into the talk. The three of them lost no time.

McLean, assistant sales manager of Wisconsin-Michigan Power Co, organized a comprehensive plan (see box) that soon enlisted cooperation of all leading distributors. The word spread.

Appleton (pop. 35,000) is ripe for good salesmanship. The area's economy, led by increasing industrial activity, is healthy. First quarter industrial power sales in the Fox Cities (pop. 39,000) area are 28% above the same period in 1957. Bank savings are up. The only thing lacking is a "buy now" psychology, which the "Best Appliance Values" program aimed to develop.

"How is it working?" McLean was asked last Monday.

"We have more leads in three days than we had the whole month before the promotion started," he answered enthusiastically. "There was very little action on May 8, but things began to take form on the 9th."

Total sales of 153 units for the first three days were 66% ahead of the first three days of a pre-campaign control period, he said. "And some stores were only open half a day on May 10, but we're counting it as a full day for the comparison," McLean added.

In the first three days of the promotion, 25 refrigerators were sold compared with 14 in three days of the pre-campaign period, McLean said. Other appliances scored these gains for the respective three day periods: 38 vs 27 washers, 22 vs 12 dryers, 24 vs 12 ranges, five vs one freezer, 13 vs nine water heaters, and 18 vs 12 television sets. Sales of air conditioning units, dish washers, and ironers held about the same for the promotion and the pre-campaign periods.

Key to the activity was that appliance dealers offered real values. There were no set prices or fixed percentage mark-downs established. But distributors and dealers agreed that, in order to boost volume, customers

How Power Company Played Key Role

1. Set up system for reporting appliance sales for ten days before the campaign and for campaign period.
2. Enlisted aid of a dealer committee to solicit contributions for some expenses, such as "kick-off breakfast" for 200 dealers, distributors, dealer salesmen, and civic leaders.
3. Informed major appliance manufacturer presidents of plans.
4. Contacted national news and trade publications.
5. Arranged dealer breakfast kick-off program.
6. Arranged for group photographs of the major appliance prizes given in "Housefull of Appliances" contest.
7. Arranged billboard publicity plugging "Best Appliance Values—Better Buy Now" theme.
8. Secured and paid for 100 radio spots.
9. Set up incentive program for retail salesmen.
10. Arranged for donation of TV set to Appleton Memorial Hospital from Fox Cities Appliance Dealers.
11. Procured proclamations from mayors or heads of seven communities on the promotion.
12. Arranged for campaign street banner.
13. Solicited support of chambers of commerce.
14. Arranged for Appleton mayor to buy first appliance in kick-off program.

*From left to right, John H. McLean, Wisconsin Michigan Power Co; Harold W. Austin, representing Major Appliances, the area's GE distributor; and Kenneth E. Davis, Appleton Post-Crescent.

Appleton, Wis., distributors set stage for what may become a national drive

for a Rebound in Appliance Sales

would be offered "appliances they want at prices they can afford to pay."

Discussions indicated that prices would be 10% to 15% below prevailing prices before the "Best Appliance Values — Better Buy Now" activity was launched. These estimates were not based on recommended retail, or list prices, but on those for which dealers had been selling appliances in the area. Price schedules were worked out between each distributor and his dealers. There was no consistency in price cuts from one make of appliances to another.

It was generally agreed, however, that prices would be restored to pre-campaign levels immediately after the May 17 closing date and that customers would know about this in advance.

Ground Rules Guided Ad Approach

One of the early steps was development of some ground rules. First of these was, "No comparative prices will be displayed or run in ads." The bargain prices were displayed and advertised but strictly on the basis "see for yourself the bargain you are getting."

Advertising carried no copy headings proclaiming carload, warehouse, and distress sales, or closeout of old models or floor samples. The promotion aimed at upgrading the sale of appliances to allow room for all dealers to make a profit.

There were no specific trade-in allowances, such as "$100 for your old clothesline on a new automatic dryer" or "$200 for your old machine in trade." Instead, prices in the ads were followed with: ". . . including trade" or "liberal trade-in allowance."

Credit terms were specific; ie, "$199.99, with terms as low as $2.50 per week for 18 months." No offers of free vacations, free weddings, or other gimmicks were used. The activity, limited to major appliances, ruled out related ad plugs for traffic appliances.

The approach was kept positive; a "back to selling merchandise for its quality, time and labor-saving features and economy of operation."

Distributor cooperation took all well-known forms of teamwork with dealers. Cooperative advertising was generally accepted as a 50-50 arrangement between distributors and dealers.

As an added sales incentive each participating distributor gave one major appliance to the "Housefull of Appliances" competition, which was part of the "Best Appliance Values—Better Buy Now" promotion.

Entry blanks for the "Housefull of Appliances" competition were made available at all cooperating dealers' stores. Contestants picked up the entry blanks to complete the statement, "Now is the time to buy for best appliance values" in 25 words or less.

Contestants indicated on the entry blank their first and second preferences of prizes offered by distributors. Dealers receiving the contest entries stamped their names on the backs. When the judging was completed each dealer had entries returned to him for prospect information.

The Appleton Post-Crescent, one of the main spark plugs of the promotion, gave heavy editorial support. A 12-page ad in the May 7 special edition was just the first step of the advertising program. Advertising was carried on radio, TV, and in other newspapers of the area. These media, too, lent support beyond the scope of the campaigns.

Recognized as a key to coordination as well as financial support to the activity was the part of Wisconsin Michigan Power Co and the ball carrying of McLean.

Many comments at the kick-off breakfast reflected the feeling that support like that given by McLean and his power company is essential to the success of such an activity.

To test and stimulate sales efforts mystery shoppers visited dealer stores throughout the campaign. These shoppers handed a $5 bill to any alert salesman who:

1. Tried to sell the mystery shopper a better appliance than the one in which initial interest was shown.
2. Talked the appliance's values.
3. Sold, quality, time saving, and other features.
4. Otherwise demonstrated good selling techniques.

The appearance of Wisconsin Gov Vernon Thomson at the kick-off breakfast underlined the regional interest in the affair. He told the gathering we should "roll up our sleeves and sell—put the wheels in motion to expand the economy."

Based on early results and the interest already being shown in the Appleton program by electrical associations, manufacturers, and utilities, the wheels are gaining momentum for the appliance men.

Utility Spending Holding Steady Despite Slump

Investor-owned electric utilities have trimmed 1958 capital spending programs a scant 2.1% from late 1957 estimates despite four sobering months of recession. This estimate is based on 100% returns to an Electrical World survey made in mid-April 1958. The survey covered 85 investor-owned utilities representing 60% of the industry's customers and 74% of total 1958 power company capital expenditures published in Electrical World Jan. 27, 1958 (see top table).

Here's how the surveyed companies reported changes in spending for major plant areas. Generation budgets were reported down 2.1%; transmission plant spending down 4.7% (for the biggest drop); distribution plant budgets down 1.4%; and miscellaneous expenditures up 1.9%, resulting in net decrease of 2.1%.

Applying these percent changes against total 1958 power company budgets reported in EW last January reveals only minor changes in dollar amounts for major plant accounts (see bottom table).

Since federal and local governments are dedicated to ease the current slump through public works spending, it has been assumed that expenditures reported to EW in December will hold firm for federal agencies, cooperatives, and municipal state and power district systems.

These figures have been combined with our latest power company survey results to give an indication of total industry capital spending in 1958. Combined figures indicate industry spending will be about $5,159 million, or 1.7% less than reported Jan. 27, 1958.

While the majority of changes are downward it should be kept in mind that with the exception of distribution plant spending all other spending areas are still above their peak 1957 levels. Following is how the new budget estimates stack up against actual 1957 expenditures reported to EW: Generation—up 16.7%; transmission—up 9.2%; distribution—down 2.6%; and miscellaneous—up 6.0%, putting total '58 spending estimates 8.7% above 1957's $4,746 million.

While survey returns were not complete enough to provide proper sample in some areas it is interesting to note changes occuring in areas having a good representation in the sample. As you would expect, the industrial areas hardest hit by the recession are showing the largest cuts. East North Central region, containing the hard hit automobile and steel industries, indicated a drop of 4.9%—the largest showing up in the survey. New England utilities also cut their '58 spending plans an estimated 4.5%. South Atlantic, which has hardly felt the recession and experienced extreme winter weather, has upped its budget by 2.9%. The only other area showing a gain was the Mountain region up a slight 0.5% although cuts reported in the South West were generally small. West South Central was down 2.8%, while the Pacific region indicated a slight cut of 1.3%.

Likewise, not all utilities in all areas followed the trend for the area. Some companies increased their spending plans while their neighbors reported cutbacks. In still more cases cutbacks in one major plant category were offset by increased expenditures in other areas. In no case were cancellations of major projects reported in the April survey.

The overall reason for the changes was best summed up in a report from one company which reported a three months slippage in the "in service date" for a new generating unit and a "redistribution of estimated cash expenditures from 1958 to 1959 and 1960."

Latest Roundup of 1958 Power Company Construction Expenditures . . .

(Millions of Dollars)

	Estimated '58 Total Budget Reported Dec. 1957*	1958 Budgets Reported Dec. 1957 by Companies Participating in April, 1958 Survey	Participating Companies Share of 1958 Budget Reported Dec. 1957	1958 Budgets Reported by Participating Companies April, 1958	Change in 1958 Budgets Between Dec. 1957 & April, 1958
Generation	1,946	1,446	74.3%	1,416	−2.1%
Transmission	662	485	73.3%	462	−4.7%
Distribution	1,274	954	74.9%	941	−1.4%
Miscellaneous	168	114	67.9%	116	+1.9%
Total	4,049	2,999	74.1%	2,936	−2.1%

Indicates Overall Spending Drop of Only 1.7% From Earlier Estimates

	Generation	Transmission	Distribution	Miscellaneous	Total
Power Companies	1,905	631	1,256	171	3,963
Municipal, State and Power District Systems, Co-ops, Fed. Agencies*	701	185	270	40	1,196
Total	2,606	816	1,526	211	5,159
% Change from Dec. 1957*	−1.5%	−3.7%	−1.2%	+1.4%	−1.7%

* Data reported in Electrical World's 54th Annual Statistical Report, Jan. 27, 1958. Source: Electrical World Surveys.

Federal Atom Role Checked

AEC's proposed '59 fiscal budget backs the Administration's request to hold the line on government reactor construction. Joint Committee on A-Energy, though, is expected to go far beyond this recommendation

The Administration, shaking off heavy pressure from congressional Democrats, will hold the line against demands that the federal government build several large power reactors. Big question now is: "Will the lawmakers let the decision stick?"

The Atomic Energy Commission, after weeks of delay, last week sent its budget proposals for fiscal year 1959 to the Joint Committee on Atomic Energy. The proposed bill would authorize only one large reactor—a $51-million gas-cooled, graphite-moderated prototype using partially enriched fuel.

Conspicuously missing is any mention of two other reactor projects the Democrats expected: provision for a plutonium-producing reactor facility and a heavy water-moderated prototype burning natural uranium. AEC made it clear that even the 40,000-kw (e) gas-cooled prototype included in the bill will not be built by the government until private industry gets a chance to participate.

The proposed bill represents an initial victory for power companies, who vigorously oppose a federal reactor construction program. It was already obvious, though, that the measure was in trouble as the joint committee launched hearings into the Administration proposal.

Relations between the Democratic-led joint committee and the Republican-run AEC long have been strained. The Democrats, favoring federal reactor construction, have been impatient with the commission's insistence on waiting for private industry to do the job.

Representatives of the joint committee and AEC last fall reached tentative agreement on federal construction of two reactors. Congressional critics scoff at AEC-inspired reports Chairman Strauss battled with the budget bureau to get the agreed upon program cleared.

"Don't forget that Strauss wears two hats—AEC chairman and atomic advisor to the President," says one Democrat. "In the latter role, he wouldn't feel bound by the outcome of the negotiations with the joint committee."

AEC sources, however, contend the agreement was never as firm as Democrats contend—that they built it up so they could "act indignant" if it fell through.

Bill Will Go Beyond Request

At any rate, conviction is strong that the committee will report a bill going far beyond the Administration request. Even power company spokesmen concede the final committee bill probably will include:

- Provision for construction of a plutonium-producing reactor at Hanford, Wash. AEC has held out against construction of such a reactor, claiming present facilities meet requirements as spelled out by the Pentagon, and that additional needs can be met by buying plutonium to be produced in European and American reactors.

Democrats say that purchase of plutonium from private reactor operators for weapons will distort development of power reactors, and arouse ill feeling in foreign lands. They also suspect a lack of candor on the part of military spokesmen who stated plutonium requirements solely in terms of current production capacity. Last week, Pentagon witnesses gave the Democrats a trump card by testifying that plutonium production must be expanded to meet weapons requirements.

Thus, the joint committee is likely to vote construction of a plutonium-producing reactor costing $126 million—and may propose that generating facilities with an output of 300,000 kw be hooked on.

- Construction of the heavy water-moderated reactor prototype is expected to be authorized, too. Democrats can point out AEC itself listed this reactor type in 1956 as one that should be built by the government if private industry lacked interest. To date, no satisfactory proposals have been submitted.
- Construction of large scale, advanced-type water reactors may be proposed by the committee, along with a larger step-up in fuel element research and development than AEC recommended.
- An advisory group will be appointed by the committee to make a study and report next year on proposals for a long-range, five or ten-year program of atomic power development. Although the AEC staff has favored such a program, most of the commissioners say it's too early to set a timetable on it.

Democratic huddles can be expected to bring more proposals.

The key battle is expected to come on the House floor, where a Democratic program of federal construction was watered down two years ago. However, the vote was close—and with the influence of former Rep Sterling Cole (R-N. Y.) missing, the outcome is uncertain. The Senate can be expected to back up the Democratic program.

The result may well be another compromise—perhaps including construction of the plutonium-producing reactor, but limiting the second reactor project to a design study.

Even if Congress votes a big reactor construction program, the Eisenhower Administration conceivably could refuse to spend the money to carry it out. Democrats already protest that the budget bureau has withheld funds on projects authorized in previous years.

GE's Bob Paxton:

- New president holds with long-term growth views for economy; tells how electric utilities can tie in with Operation Upturn
- With inflationary trends expected to continue, Paxton believes, 'In a year or two, today's prices may be at bargain levels'

On April 23 Robert Paxton was elected GE president, succeeding Ralph J. Cordiner, who moved up to chairman of the board. Affable in a quiet way, Paxton takes on overall responsibility for managing operation components of GE. He joined the firm in 1923, fresh from Rensselaer Polytechnic Institute. Paxton rose through the Philadelphia Switchgear Works to become in 1950 manager of manufacturing policy. He became a vice president later that year. In September 1957 Paxton was appointed executive vice president-operations and elected to the board.

Q: What does General Electric think of prospects for an upturn in the general economy by the end of 1958?
Paxton: In our 1957 annual report Mr Cordiner said, "The management is making its plans on the assumption the nation will resume its long term growth within the year." We are acting on that assumption. The more we learn about the current recession, the more apparent it becomes that industry can effect its own recovery.

How has the recession effected GE operation, particularly in electric utility apparatus?

This recession is largely confined to consumer and industrial durable goods, and our departments in these areas have experienced generally reduced sales volumes. However, with utilities planning to add twice as much generating capacity this year as in 1957, our apparatus divisions have been operating at a good level, and the backlog of orders indicates this will continue for some time.

GE recently announced inauguration of Operation Upturn to help combat the recession. What sparked the idea?

We felt what was needed to dramatize the shift from the sellers' to the buyers' market and to make the hesitant durables market come alive was a customer-focused effort by everyone in business and industry. With disposable personal income at near record levels and personal savings at the highest peace-time level, there is still a great market potential. But the customer wants to be "sold", in the best sense of the word. Operation Upturn mobilizes the resources of every GE department in a drive to bring extra values and renewed confidence to our customers. It is not simply a sales promotion effort, but a program for more explanatory selling, better product service, and more accurate anticipation of customers' wants from our marketing force; improvement of product design and performance from our engineers; increased productivity and reduced production cycles from our manufacturing personnel; and more attractive credit arrangements from our financing operations.

How can electric utilities contribute to the success of Operation Upturn?

I think there are four ways in which they can tie in with our program and so help both themselves and the economy as a whole:

1. Intensify their own efforts in pushing such national programs as Live Better Electrically and Housepower. There is still much that can be done to promote the concept of electrical living.

2. Help their industrial customers to cut costs and improve product values through programs of electrical modernization.

3. Continue to carry forward plans for modernizing generating and distribution facilities. During the rapid load build-up of recent years some utilities have added temporary facilities which cannot be fully efficient over the long term. Now is the best time to modernize to meet future needs. Never again will they be able to do this at today's favorable prices.

4. Make expansion plans on a steady, long-term basis. We know we shall have to meet expanded demands from an expanding population and economy in the years ahead. I urge utilities not to be tempted into curtailing plans. By keeping expansion programs on a steady footing they can avoid extra costs that inevitably ensue when apparatus manufacturers operate facilities on an on-off basis.

Pilot for Aggressive Upturn Plan

Do you expect to maintain present price levels during Operation Upturn?

From 1939 to 1957, GE prices have risen only 75%, compared with a 117% increase for commodity prices (excluding farm products) on the national level. In the same period, our raw material costs have gone up 143% and payments to employees, including salaries, wages, and cost of benefits, have risen 240%. Within the last few weeks, the cost-of-living escalator provision in our current union contracts resulted in a further 1½% increase in wage costs, which makes our present prices even better value. One important aspect of Operation Upturn is a drive for improved efficiency and reduced unit costs, but further increases in material and labor costs that cannot be covered by higher productivity will, I am afraid, involve an increase in our asking prices. I should make it clear that each operating department is responsible for meeting going prices in its own market, so no generality I make should be taken as prescribing price levels in detail in any specific area of our operations. In general, I believe our prices are already very favorable, especially in comparison with other industrial prices, and in face of the increase in our own costs.

The 3% price increase on GE turbines raises the question: Is this adjustment a forerunner of other increases in electric utility apparatus?

If, despite our best efforts at improving production efficiency, rising material and labor costs increase our unit costs, our departments will be obliged to raise asking prices—for we have absorbed rising costs to the point where there is no more milk in the coconut.

The price increase in a recession would seem to worsen prospects of an upturn in capital spending. How did GE arrive at the decision to raise turbine prices at this time?

We regret it has been necessary to increase turbine-generator prices at this time. However, inflation is continuing in both materials and labor costs. Therefore our ability to continue providing more efficient and reliable units which the utilities need depends on our maintaining fair and adequate prices. Since the last turbine-generator increase in July 1957, cost of materials and labor increased 4.5%. Our customers understand that in extended inflation prices don't stand still. In a year or two, today's prices may be at bargain levels.

Could GE have foregone its price increase on turbines if the utility industry had standardized completely on turbine-generators?

Complete standardization of these units might permit small reduction in costs and delay some price increase. However, the industry's accomplishment in providing low-cost power has been brought about largely by bold, forward steps in areas of higher steam conditions, reheat cycles, and larger unit ratings, which would not have been possible under complete standardization. Rapidity of these improvements has precluded standardization of complete turbine-generator units. Our approach to standardization will continue in the area of component parts, rather than in complete units.

What changes do you see in the general trend of electric utilities to maintain low inventory levels?

In general, we find utilities' inventories of distribution equipment are down about 15-20% from 1957 levels, partly because their stocks were unusually high last year. Also, there is a tendency to carry lower inventories because they are aware that manufacturers are carrying stocks of finished materials in warehouses throughout the U. S. We do not expect any utility will carry more than three months stock of such items as distribution transformers and watt-hour meters.

What are your views on the effect of foreign competition in the apparatus field on the continued health of the electrical industry in this country?

In our opinion the continued health of the electrical industry is less an issue than the weakening of U. S. security. As we pointed out to Office of Defense Mobilization, the question is one of national security—the threat which might result from inability of foreign manufacturers to promptly repair foreign-built generating equipment in event of emergency. ODM has established an inter-agency committee to study the national security aspects of such imports. We have pledged our full support in supplying the committee with relevant facts.

(*Continued on page* 148)

TOURING TIME finds, from left, VP James Crawford Paxton, and VP Arthur Vinson inspecting the Direct Current Motor and Generator Department in Erie, Pa.

Swing to Al for Service Cable

C. L. LUCAL, System Meter Superintendent, Ohio Power Co, Canton, Ohio

P. E. PFISTER, Superintendent of Meters, Indiana & Michigan Electric Co, Ft Wayne, Ind.

The difference between aluminum and copper costs has prompted Ohio Power Co and Indiana & Michigan Electric Co to install all-aluminum, 3-conductor service entrance cable, Type SE, for home service risers since January, 1949.

The companies have installed an estimated total of 1,600,000 ft of No. 4 and 900,000 ft of No. 2 aluminum cable, the latter size being used for 100-amp residential services. This cable has two semi-annealed parallel insulated conductors around which a third bare conductor is wrapped concentrically to produce an oval cross-section. The whole assembly is encased in a weatherproof, flame-retarding, painted braid.

Aluminum compression sleeves join the aluminum service drop conductors to the service entrance riser conductors. A corrosion-inhibiting grease, having fine metal particles dispersed throughout it, is used in the compression joint. The two insulated conductors are connected directly to the line terminals of bottom-connected meters, no corrosion-inhibiting compound being used. The neutral wire of the cable is connected by a stud bolt connector in the metering enclosure. Such connections have given no trouble.

When aluminum SE cable was first used to connect meter sockets, compound was not used at the connector, and little difficulty was experienced. All sockets now purchased by the companies come with terminals for aluminum conductor. The terminals should be plated to minimize the galvanic effects of dissimilar metals and should be designed to provide spring pressure on the conductor as well as large areas of pressure pad or clamping screw.

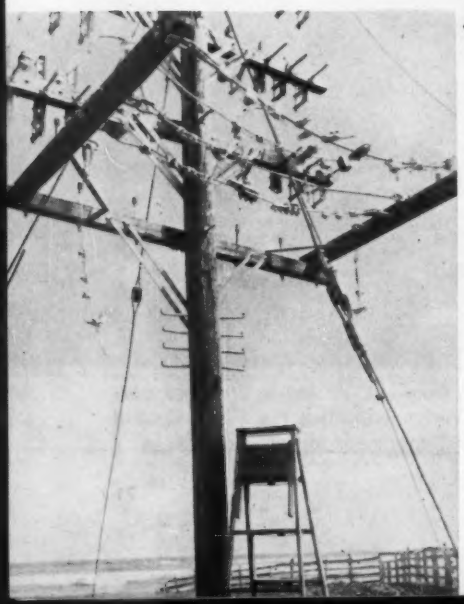
Laboratory tests on meter socket terminals showed that initial contact resistance is reduced appreciably when corrosion-inhibiting compound is used on the conductor before it is secured to the terminal. Treated socket connections after several cycles of heating and cooling (full rated current on the socket for 8 hr and off for 8 hr), showed substantially the same contact resistance. Tests on untreated connections indicated that contact resistance tended to increase after several cycles.

Meter socket terminals of copper or copper alloys have a coefficient of expansion less than that of aluminum. Aluminum conductors carrying rated current were expected to expand more than the copper terminal, resulting in high-pressure contact in the terminals. This expansion is an advantage, provided the pressure is not enough to force flow of the aluminum from within to outside the terminal. This pressure is controlled by designing spring pressure into the terminal, so that the terminal follows the expansion and contraction of the conductor.

The area of the clamping pad or screw has been made large enough to maintain unit pressure on the conductor at a relatively low value. But the pressure buildup crushes the thin film of aluminum oxide surrounding each aluminum strand, permitting a strand to carry its proportionate current. Accordingly, strands in the outer layer of the conductor do not have to be depended upon to carry most of the current in the terminal.

The insulating effect of the strands' oxide film becomes more noticeable as the conductor size and number of strands increase. Corrosion-inhibiting compound, having fine particles of metal dispersed throughout it, overcomes the insulating effect of the oxide film. Under pressure, the metal particles pierce or shatter the oxide film to form conducting paths between strands, producing the effect of a solid conductor.

From the tests it was concluded that satisfactory connections with aluminum conductors can be made in meter sockets whose terminals are designed for aluminum, without the joint compound. The compound, nevertheless, facilitates the making of good connections and further assures long and trouble-free service.

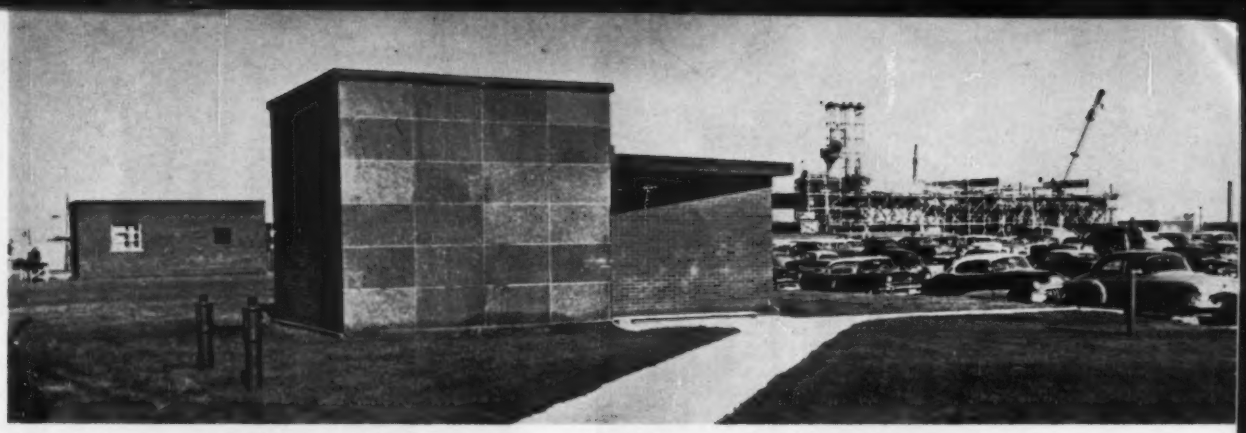


Test Aluminum Hardware in Coastal Air

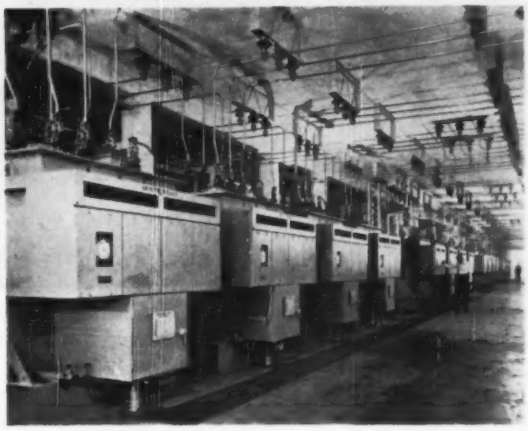
Life tests on distribution-line hardware are conducted in actual marine-corrosion conditions on Hawaiian Electric Co's Kahuku Point test rack, which stands completely exposed to salt spray in the steady trade-winds on the windward side of the Island of Cahu.

The rack is on a 25-ft pole about 250 ft from the highwater line. It is draped liberally with various makes and designs of deadends, midspan clamps, parallel groove connectors, hot-line clamps, and other items of hardware. The rack's conductors are not energized. Parallel-groove clamps and connectors, however, are on aluminum conductors with a 6-in. piece of copper conductor in the lower groove simulating aluminum-to-copper connections.

Expecting to go to aluminum totally, the company is cooperating with a major aluminum manufacturer in conductor corrosion tests on the windward-side circuits. Inspections are made every six months, and records are kept of each item's changing condition.



Beneath attractive Montreal park and serving residential and commercial load . . .



This 32,000-kva, 14-feeder substation . . .

is controlled from distant station as . . .

Quebec-Hydro Goes Underground

An underground distribution center for residential and small commercial loads was built in Montreal by Quebec Hydro-Electric Commission because above-ground space was at a premium. This 32,000-kva station, known as Esplanade Transformer Vault, is unattended and supervisory-controlled.

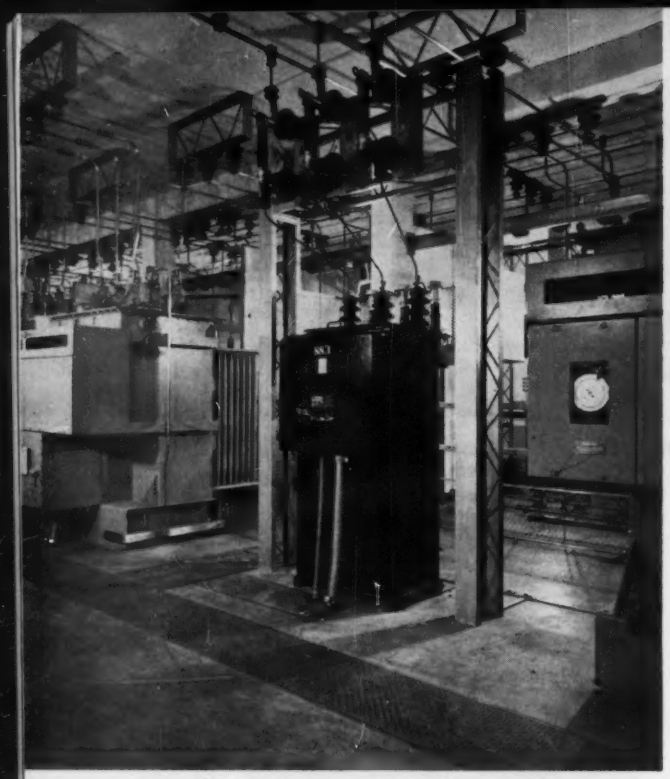
At ground level the station presents an area of appealing city parkland. A small brick building at either end houses access stairwells, ventilating fans, and louvers. A large hatchway provides an entrance for equipment. Quebec-Hydro engineers feel this station could be built as conveniently in the basement of an apartment or office building. It could be the answer for substations in large cities where land is unavailable because of ordinances or economics.

Esplanade station has three incoming 12-kv lines and 14 outgoing 4-kv feeders. Two main 12-kv buses are fed from three, 12,000-kva, 500-Mcm, two-cable circuits, with a fused 75-kva station-service transformer connected to each circuit. Pellet-type arresters protect station-service transformers.

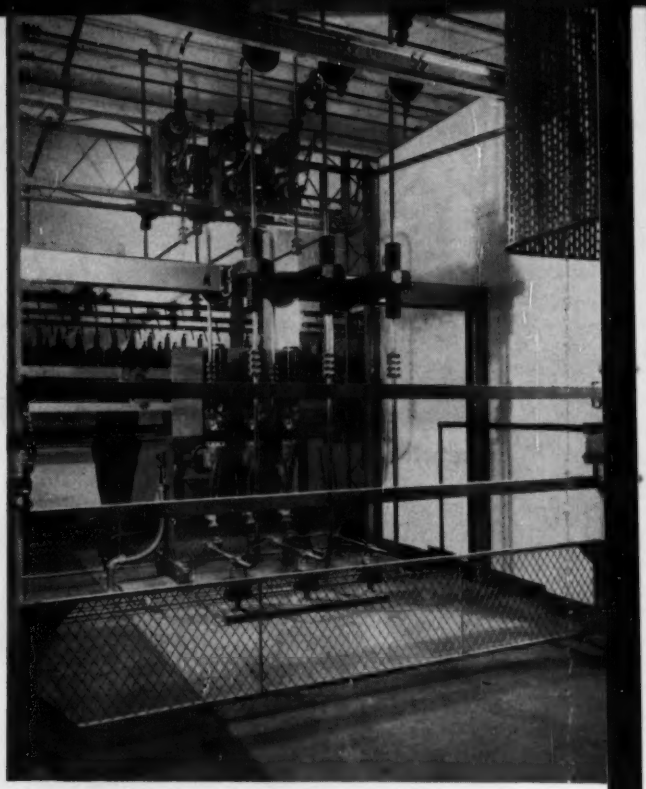
From either main bus, sixteen 12-kv, 1,000-amp, 600-Mva air-blast breakers each feed a 2,000-kva, 12-4-kv delta-wye distribution transformer with $\pm 7\frac{1}{2}\%$ regulation. Fourteen of these units feed outgoing 4-kv 350-MCM, 300-amp cables; the other two serve a 4-kv transfer bus, or a 3,750-kvar capacitor bank when the bus is not being used.

The main switchboards at Esplanade station include relay protection, metering circuits, and air-blast breaker controls. This cabinet-type equipment, in a separate room in the vault, was designed by Hydro-Quebec engineers specifically for use in small control rooms. Because board interiors need be accessible only from the front, the main switchboards were placed close to the walls. Each panel is a door which mounts control switches, indicating lights, relays, instruments and recorders.

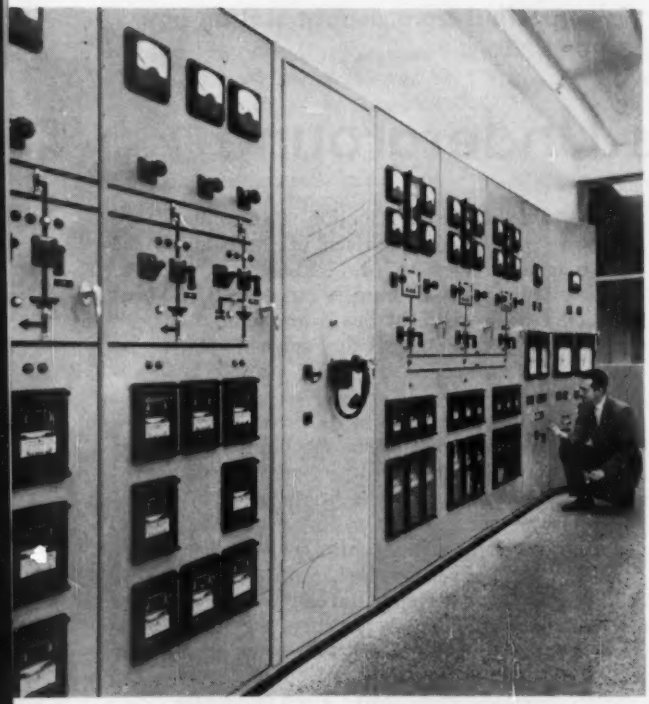
A single-line diagram is traced on the switchboard with mimic bus. Master recorders are mounted on two separate panels. Selector switches allow a choice of several voltages and currents which can be recorded simultaneously. Each incoming 12-kv line has three directional overcurrent and three overcurrent relays for line and bus protection. Each 4-kv feeder, including a 12-4-kv transformer, is



STATION SERVICE transformer rated 12-kv-120/208-v, 75 kva is tied to incoming feeder with power fuses. Pellet arresters provide the station's only surge protection



AIR-BLAST BREAKER tapped into two main 12-kv buses feeds a 12-4-kv regulating feeder. In the rear is part of the station's 3,750-kvar, 12-kv capacitor installation



MAIN SWITCHBOARD was designed for front-end maintenance in small control room. Switchboard mounts controls supervisory cubicle, and master recorders

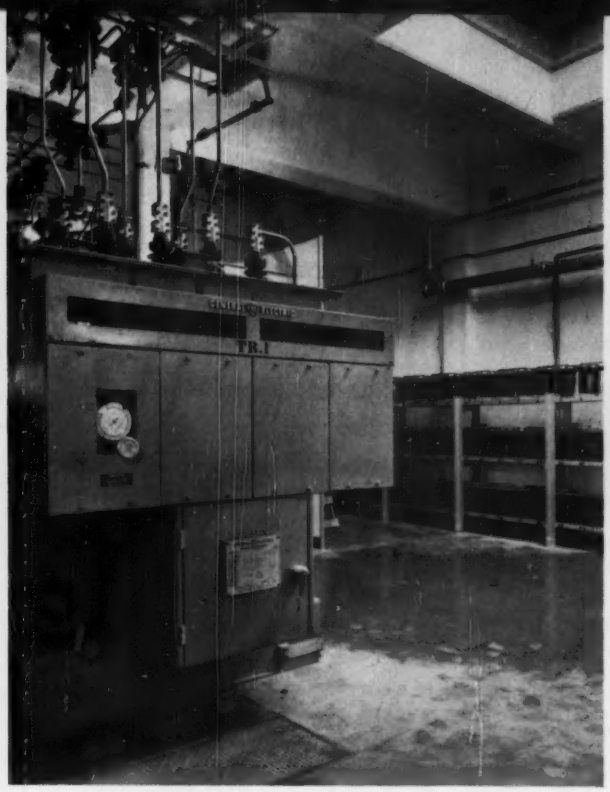
protected by four overcurrent relays plus back-up.

This unattended substation is controlled from a master station at Fleury Control Center, one of four in the metropolitan area. This master station also controls 15 other substations of the same type; ultimately it will control 20. Supervisory control equipment consists of a cabinet-type panel at Esplanade and a master bench board at Fleury. The control center operator can operate all breakers at Esplanade and has a constant display of their positions. He can read kw in-feed of any line and totalized kwhr.

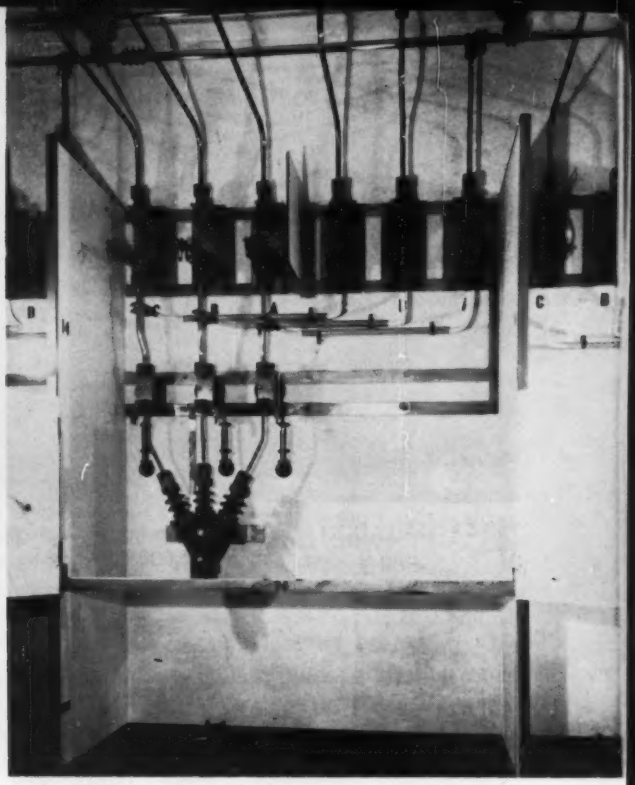
An alarm is sounded at the control center for abnormal temperatures and pressures or for relay operation. There is direct telephone communication between Esplanade and the control center. Communication and control information is transmitted over a single telephone circuit.

Control power for the substation is 125 v dc, supplied by a lead-acid battery in the switchgear room and maintained by two automatic battery-chargers, one serving as stand-by. Dc services and 120/208-v station service are distributed through a three-panel switchboard. Automatic throw-over equipment will energize the main bus from any of three station-service transformers. In the event of complete power failure, an independent and automatic emergency supply will pick up such essential services as a compressor, sump pump, a few lights, and two ventilating fans.

The underground station is on one level in a waterproof, ventilated, concrete vault. It is wrapped



4-KV FEEDER transformer has arcing contacts in air outside main tank and selector switches inside tank. Self-cooled units are non-flammable liquid-filled



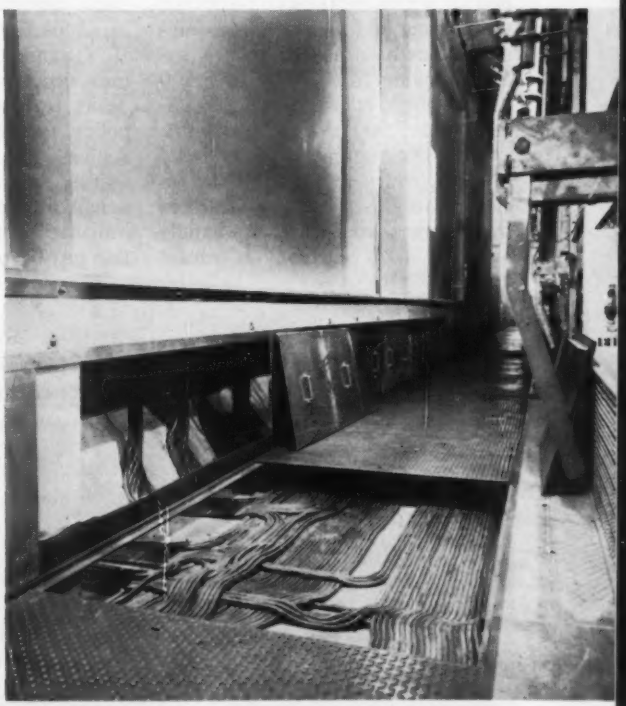
OUTGOING 4-KV FEEDER ties to feeder transformer or transfer bus through disconnects. Cable head has grounding disconnects. Cables run in 4-in. duct lines

with a waterproof membrane along floor, walls and roof to keep moisture out. A vapor barrier on the roof and the top part of the walls prevents condensation. A 1-in. cork slab, covering the same area as the vapor barrier, retains heat to keep the vault warm during the winter and to prevent drying the top soil during the summer.

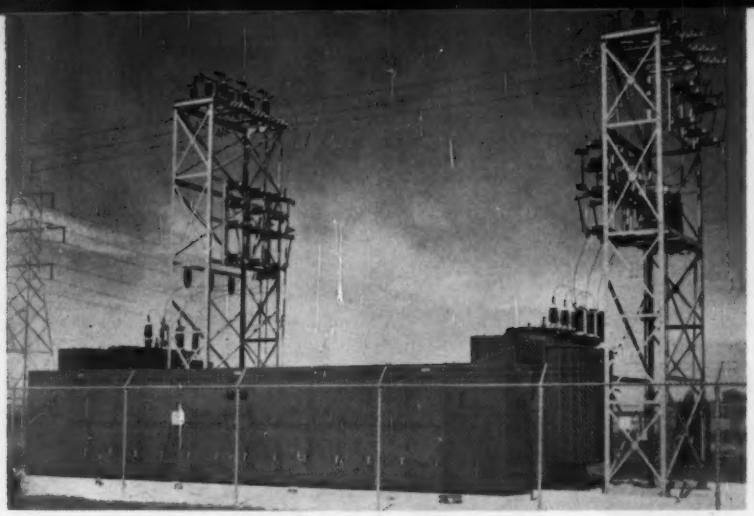
Excess heat is removed by automatic fans and louvers. Cool air drawn through louvers in one of the brick houses is carried through metal ducts under the vault floor and discharged through vents under each 12-4-kv feeder transformer radiator. Fans in the second house, at the other end of the vault, evacuate air to give eight changes per hr.

Fireproof materials are used throughout the vault to eliminate fire hazards. All transformers are self-cooled and filled with non-flammable liquid. Tap changer arcing contacts are in air outside the main tank; tapping selector switches operate in liquid in the tank. Non-flammable liquid-filled capacitors are on open racks in the same room with other apparatus.

Compressed air for air-blast breaker operation is supplied by two automatic and independent systems, both normally in operation. Either can be taken out of service without discontinuity of air supply. Air is stored at 400 psi and dropped to 225 psi through reducing valves to operate the breakers. Should the pressure change from normal, an alarm is sent over supervisory control to notify the control center operator.



CONTROL CABLE TRENCH was used because station is on one level, precluding use of trays or racks below switchgear. Air pipes run generally in front of breakers



FIRST INSTALLATION in suburban area has three single-pole reclosers for each of 12 outgoing feeders. Rating of 5,000 kva may be raised 25% with fans

Attractive

- **Single-pole reclosers cut feeder switchgear costs by more than 50%**
- **High-capacity fuses in series with reclosers interrupt fault currents in excess of recloser ratings**

R. A. SWITZER, Substation Design Engineer, Extension System, Wisconsin Electric Power Co, Racine, Wisconsin

Metalclad substations using single-pole reclosers on outgoing feeders reduce investment costs by more than 50% and provide attractive stations in suburban areas for Wisconsin Electric Power Co. This design, which includes conventional transformer and high-voltage equipments, has been applied to five stations ranging from 3,000 to 5,000 kva in single-transformers installations and 5,000 kva for two units.

High-interrupting capacity fuses in series with and ahead of the recloser are used with 3,750-kva transformers and above to handle available fault currents in excess of the recloser rating. More than two years' experience with the original substation indicates that stations of this design should function satisfactorily. Furthermore, single-pole reclosers provide single-phase protection which is an essential element in the company's philosophy of system operation.

This move to lower cost metalclad substations has its roots in rapid load growth since World War II, a trend toward zoning codes in unincorporated county areas, and a desire to foster a "good neighbor" policy, even in areas where enclosed stations are not specifically required. The move began when neighborhood opposition arose to construction of a distribution substation just beyond the corporate limits of a small village in the greater Milwaukee area. Although a simple open-type rural station could have been built, it was decided as a matter of policy and good public relations to enclose at least the low-voltage portion of the station.

However, cost of conventional cubicle-type switchgear was considered excessive for the capacity required. Thus, on the basis of satisfactory operating experience in the protection of rural substation feeders, line-type, single-pole reclosers in steel cubicles were chosen for the new substation. They replaced the more expensive three-pole air breakers generally used in conventional metalclad switchgear. Reclosers are applied so that all industry standards of insulation for switchgear are met. Use of reclosers also eliminates relays, batteries, control wiring, and associated gear.

At the time the first station was designed, no one manufacturer could supply all the desired equipment. Thus, substation components were purchased from several suppliers. Enclosed portion of the station consists of a 8,320-v auxiliary cubicle throat connected to a 2,500-kva, 26.4-4.8/8.32-kv wye, 3-phase, LTC transformer, 12 single-phase, 4.8-kv feeder cubicles, and a 8,320-v bus-tie cubicle.

The high-voltage side is similar to a conventional design for metalclad or open-type stations, with the transformer served through a load-break switch-fuse combination. A second 2,500-kva transformer and

NEWER INSTALLATION has enclosed high-voltage equipment. Initial rating of 3,750 kva will be doubled when an ultimate of six feeders are installed

Stations Have Lower-Cost LV Side

its low-side cubicle were added later to complete the ultimate station plan. The low-voltage portion is shown in the diagram.

Auxiliary cubicles contain a 3-pole load-break disconnect switch, three CT's, two PT's, a 7½-kva single-phase distribution transformer, and three single-phase watthour demand meters. The externally-operated load-break switch permits the transformer and auxiliary equipment to be disconnected from the bus without danger of flashover. Instrument transformers are used for metering only. The 7½-kva transformer supplies power and potential for tap changer, potential for the third meter, and power for cubicle heaters.

Meters and unit breakers for 120-v circuit protection are in an isolated compartment of the cubicle, accessible only through a separate outside door. A 3-phase flat copper bus extends through the upper part of the row of cubicles from one auxiliary cubicle to the other. A continuous flat copper ground bus is in the lower compartments.

Each phase of each feeder has its own cubicle containing a single-pole recloser, two single-pole, load-break hook-stick-operated disconnect switches, and a by-pass fuse. The 1/c feeder cable exits through the cubicle floor. A horizontal barrier isolates the recloser from disconnect switches and the main bus. Additional vertical barriers were installed where phase-to-ground clearances were reduced for greater compactness. The bus-tie cubicle contains a gang-operated load-break disconnect switch with external control lever.

Fuse Bypasses Recloser

Two single-pole, load-break switches in series with each recloser provide maximum safety for operating personnel. They also permit servicing without the use of complicated and expensive interlocks. If an operator should incorrectly pull a disconnect without first closing the by-pass fuse or opening the recloser, at the worst one phase of a feeder would be interrupted, but it could be picked up immediately by reclosing the switch. The by-pass fuse permits routine or emergency removal of a recloser without need for a transfer bus or outside switching. The fuse is in use only while the recloser is out of service.

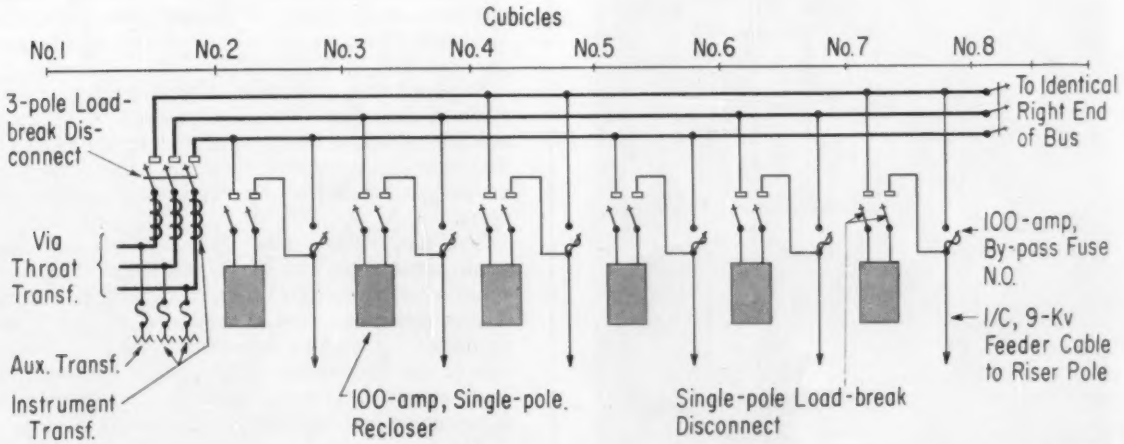
Two additional stations of this type and voltage have been installed, one with a 3,750-kva transformer and the other 5,000 kva. In each case provision was made for installation of a second transformer. Another station of 3,000-kva capacity is being built. This station varies from the others in that the 26-4-kv switchgear is steel enclosed, with an underground supply entering the transformer through a throat connection. Feeder voltage of all these stations is 4.8/8.32 kv wye.

A fifth station of 3,750-kva capacity with enclosed 26.4-kv switchgear has been placed in service. It is similar to the 3,000-kva installation except that feeder voltage is 2.2/3.81 kv wye.

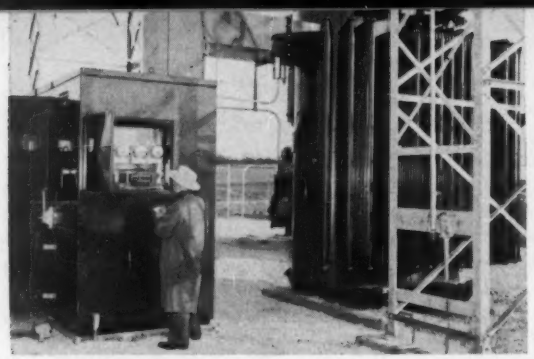
Available fault current at 2.2/3.81 kv wye using a 3,750-kva transformer exceeds the recloser rating. To handle this current, a high-interrupting capacity fuse was inserted in series with and ahead of the recloser. In this scheme, a third load-break disconnect switch is used as the recloser by-pass, the fuse remaining in the circuit at all times.

Fuse size is coordinated with recloser tripping characteristics so that it will blow only for faults above the rated rupturing capacity of the recloser. Detailed coordination tests were made in a high-current testing laboratory. Oscillograms show the fuse will interrupt faster than the recloser every time for faults hazardous to the recloser.

Single-pole reclosers provide an opportunity to implement the company's preference for single-phase protection. A question may be raised regarding the effect of single-phase protection on four-wire feeders. Some manufacturers insist that



SINGLE-POLE RECLOSERS fed by a 2,500-kva transformer may be bypassed with 100-amp fuses for maintenance, eliminating need for a transfer bus. Single-pole load-break switches provide a maximum of safety for personnel



ISOLATED COMPARTMENT in cubicle on low-voltage side contains single-phase watthour demand meters and unit breakers for protection of the 120-v circuits

the industry demands three-phase operation. But, because the majority of faults on a distribution system are single phase, there is no justification for interrupting all customers on a feeder for each single-phase fault.

More than 20 years' operating experience has been accumulated covering more than 50 distribution substations from 1,000 to 11,000 kva serving rural, suburban, and city loads. This experience verifies that single-phase protection for four-wire common-neutral systems is the ideal scheme. Customer complaints of 3-phase motor burnouts caused by loss of one phase are rare. They would never occur if all motors were properly protected. In addition, uncounted thousands of single-phase customer-hr of outage have been prevented.

Reclosers can be adjusted for a variety of operating sequences. In all cases, station reclosers are set for four retarded operations before going to lockout. This arrangement provides the maximum latitude for operation of branch line reclosers and fuses.

THIRD LOAD-BREAK disconnect switch is used to bypass recloser fed by 3,750-kva transformer. High-capacity fuse will handle currents exceeding recloser rating

Factory-Packaged

- HV fuses and arresters are on tank
- Steel frame mounts LV disconnects, arresters, CT's, PT's, and reclosers
- Design and installation time reduced

J. M. HEDGES, Electrical Engineer,
J. J. TRAINOR, Vice President,
Public Service Co of Indiana, Plainfield, Indiana

Development was sparked by Public Service Co of Indiana of an economical and readily-available "factory-package" transformer and switching substation to serve suburban and rural areas and some municipalities and industrial customers. Together with Moloney Electric Co, they worked out a very satisfactory and unique arrangement.

A 3,750-kva, 67-13-kv wye, 3-phase LTC transformer is equipped with high-voltage lightning arresters and fuses mounted on the top of the tank. Attached to one end of the tank is a structural steel frame which supports low-voltage equipment. This equipment includes bus-side disconnect switches, lightning arresters, and oil circuit reclosers for two low-voltage circuits.

Unit Achieves Five Objectives

Development of the "factory-package" substation unit was prompted by consideration of comparative costs of conventional and metal-clad switchgear substations and the number of purchase orders required to obtain them, particularly the conventional steel-structure substation with parts ordered separately and from several suppliers. Other considerations were storage of equipment and materials, and the considerable time required for design. Important savings of time and field labor for assembly and portability also were objectives in the development of a factory package.

Salvage was a problem with former types of substations. The new unit can be moved readily to a new site as load growth requires increased capacity. The new unit is referred to as the "integrated suburban-type substation" by Public Service Co engineers.

The new unit is really a completely-packaged small substation. On the high-voltage side, suspension insulator deadends can be attached to transformer lightning arrester supports. Arresters are supported by brackets attached to the high-voltage side of the transformer. High-voltage bushings are cover-mounted. Transformer fuses are supported by high-voltage bushings and the lightning arresters.

The transformer has provisions for operation at 4,687 kva, or about a 30% increase over initial capacity. Load-tap-changing controls and equip-

Substation Feeds Suburban Load

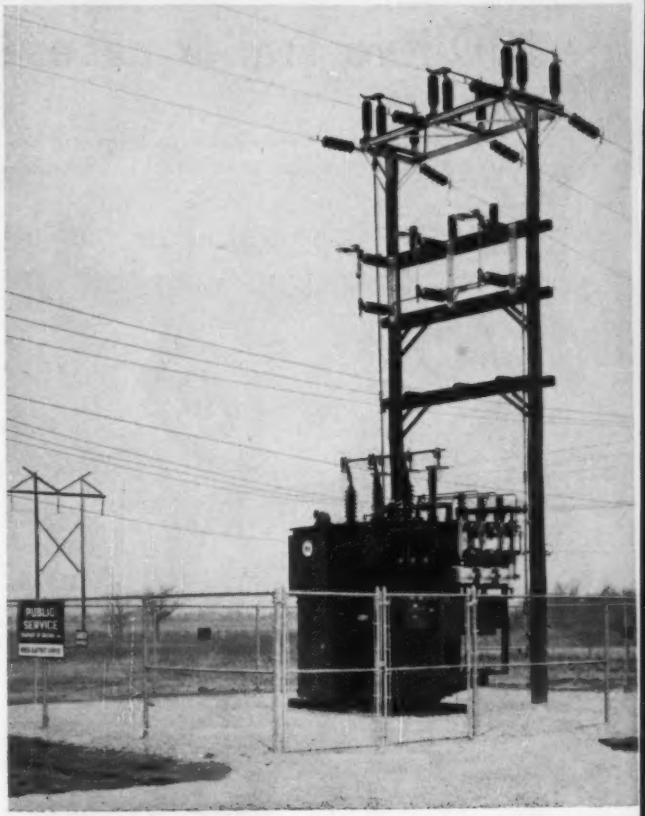
ment provide ±10% voltage regulation in 32 steps of ⅝%. On the low-voltage side, all bushings are cover-mounted. Six stick-operated 15-kv bus-side disconnect switches are mounted on the steel structure which is attached to the low-voltage end of the tank.

Two electrically-operated, 15-kv, 3-phase oil circuit reclosers are mounted on the steel structure. This structure is designed to accommodate various makes of reclosers. Also included are three bushing-type CT's and three single-bushing 60/1 PT's. Three 15-kv drop-out fuses connect the PT's to the low-voltage bus.

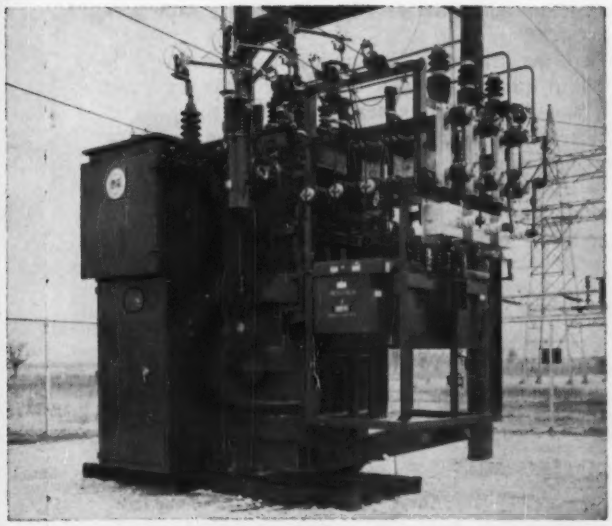
Power for reclosers and tap changers is supplied by a 5-kva 7,200-120/240-v CSP station-service transformer mounted on the low-voltage end of the main transformer. The 12.5-kv feeder deadend insulators are attached to the low-voltage steel structure. Low-voltage arresters also are fastened to this structure.

While the factory-package unit was being built, PS Co of Indiana prepared the site for the unit. The company installed a creosoted timber transformer foundation, station grounding bus, substation fence, high-voltage transformer disconnect switch, and low-side disconnect and by-pass switches.

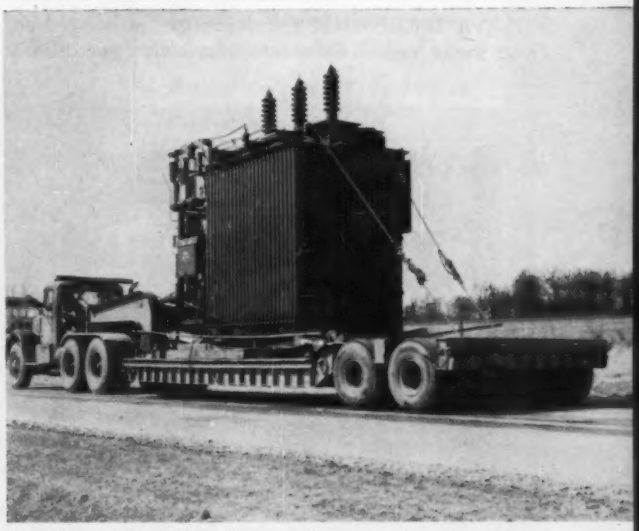
Weight and dimensions of the integral substation are such that it can be transported by trailer over Indiana highways for use as a mobile substation. If required at a location for a considerable time, the unit can be placed on a timber foundation and the trailer returned to normal service.



LOW-COST PACKAGE needs foundation, grounding bus, fence, disconnects and by-pass switch to complete the station. These are installed before the unit arrives



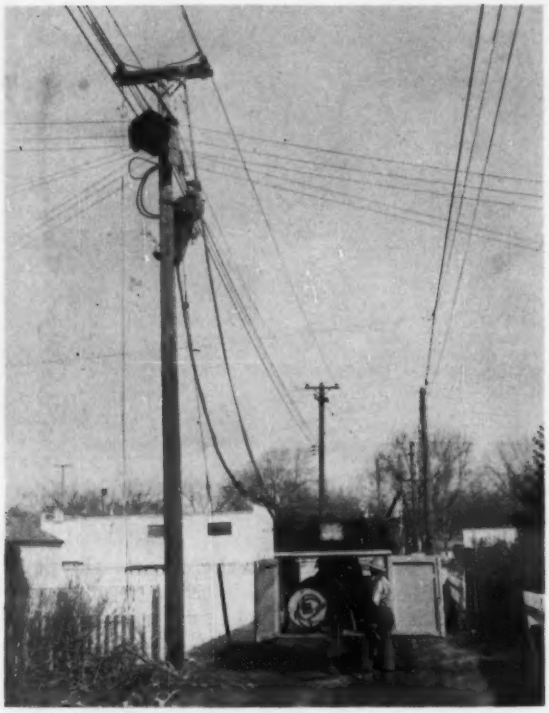
INTEGRATED SUBSTATION is built around a 3,750-kva, 67-13-kv wye, 3-phase, load-tap-changing transformer



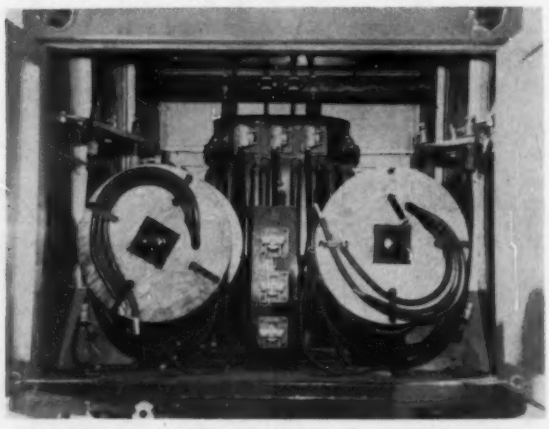
WEIGHT AND DIMENSIONS allow transformer to be carried over Indiana highways as a mobile substation

100-Kva Trailer Eases Distribution Problems

H. J. WURTH, Engineer, Commonwealth Associates, Inc
G. A. NEWSOM, Engineer, Consumers Power Co, Jackson, Mich.



100-KVA SINGLE-PHASE transformer trailer has proved a most useful tool in Consumers' distribution operations



"SECONDARY" END of trailer contains 4,800 or 7,200-v transformer with two reels of 120/240-v 3-wire secondary

A 100-kva single-phase transformer trailer, designed to incorporate several novel features, has developed into a most useful tool in distribution operations. The unit has one 4,800 or 7,200-v transformer with 120/240-v 3-wire secondary.

Originally planned to replace temporarily transformers removed for shop inspection, it now allows pole-top inspection of out-of-service transformers with a worthwhile reduction in line crew time. It also is used for quick restoration of service where a transformer has failed, for paralleling overloaded banks serving commercial customers until a more convenient time can be arranged for permanent connection, and for service up to one week to carnivals and other customers.

The "secondary" end of the trailer contains two cable reels, each holding 40 ft of 2 No. 4/0 and 1 No. 1/0 conductors which can carry 50 kva of 120/240-v 3-wire load. The lifting blocks, hot-line clamps, and ferrule-tipped conductors allow phasing out and connecting within 15 min in an emergency.

The single primary reel holds two 70-ft No. 4 conductors. Cables are rated 5,000 or 7,500 v, depending on service voltage. The trip-out fused cutouts provide switching and protection. Lightning arresters were not deemed necessary since the regular service arresters are left connected while the trailer-mounted transformer is in service. A removable plate in the trailer top allows easy transformer changes.

A 6-v battery and charger permit operation of warning and clearance lights when no other power source is available. A cable connects warning, directional, and brake signal lights to the towing vehicle. A switch and resistors adapt the 6-v lights to trucks with 12-v batteries.

When the trailer is in service, the secondary is tapped to provide power for the charger and for 125-v floodlights and power tools. The sheet metal covering and locks on all doors permit the trailer to be left unattended indefinitely.

The trailer, excluding the tongue, is 8-ft long, 6-ft wide, and 8-ft high. As it has only two wheels and an adjustable landing leg, the trailer is highly maneuverable, although it weighs nearly 5,000 lb.

A door in the top above each reel provides for cable exit and allows natural-draft cooling air to flow up through the open wooden floor. A level-load axle helps achieve a low center of gravity and stability, which allow the trailer to be towed at highway speeds in emergencies.

These units have contributed so much to faster, more economical service that they will be soon supplemented by 3-phase 500-kva trailers.

(*More How To on page* 85)

GE METERS

General Electric's Ne
I-60 Watthour Mete
Gives You

"ON-LINE" ACCURACY AT LIGHT LOADS

As you can see from this load curve, the I-60 is right "on-line" at 30-amp meter test currents of 3 and 30 amps, and 15-amp meter test currents of 1.5 and 15 amps.

Plus...

200-Amp Capacity!

I-60 LOAD CURVE

% REGISTRATION

LOAD IN AMPERES

Progress Is Our Most Important Product

GENERAL ELECTRIC

me, General Electric's popular new I-60 meter
nes it when it comes to truly outstanding "on-line"
cy at light loads. It's terrific!
d that's not all. Even at a full 200 amps, the I-60
's accurate within three-quarters of one percent.
ny other Class 200 meter designs place major empha-
on the heavy end of the meter load curve (often at
e expense of light-load accuracy). But General Elec-
ric's new I-60 is highly accurate throughout its full
00-amp range. As a result, you'll find that the I-60 is
apable of accurately metering both today's light loads
and the heavier loads of the future . . . with an invest-
ment no greater than for existing Class 100 meters!

But don't just take my word for it. Find out yourself
by putting the I-60 to work for you right now. Fact is,
you'll discover, like so many other utilities have, that
the I-60's tremendous performance at light loads makes
it equal to or better than any other single-phase Class
100 meter on the market.

Your General Electric salesman will be glad to show
you more reasons for the I-60's outstanding "on-line"
accuracy at light loads.

Watthour Willie

Revolutionary meter beats problem of "split" coil construction, which previously limited Class 200 designs. It requires less material and inherently costs no more to manufacture than conventional Class 100 meters.

Exclusive G-E magnetic suspension system gives the I-60 meter outstanding accuracy for both today's and tomorrow's loads. It virtually eliminates friction and tilt-error problems. No bearings to replace, either.

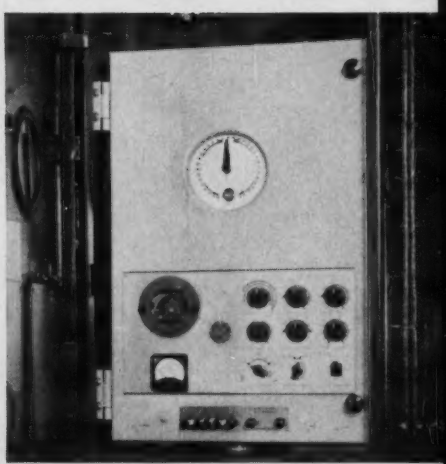
Charlie –

Please note and return. If what this Watthour Willie character says is true, G-E's new I-60 can really give us the accuracy we need for light-load metering. Suggest we contact the G-E man on this.

Bill

METER SUPERINTENDENT

New Static Relay makes...



NEW SIMPLIFIED CONTROL is easy to get to, allows quick inspection. Locking knobs hold settings securely.

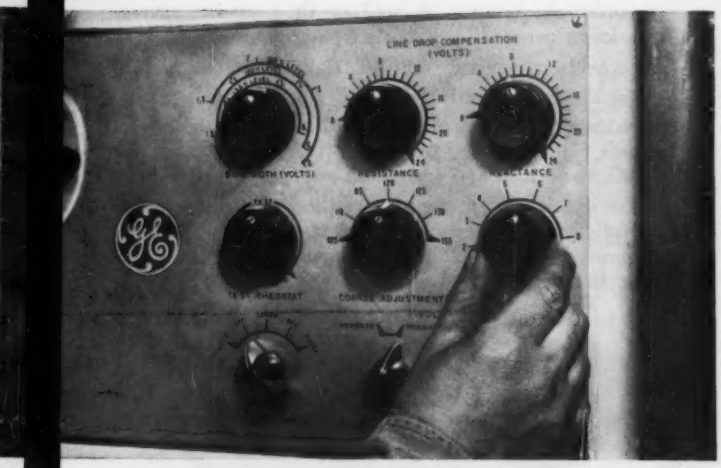
New Static Relay eliminates VRR contacts... permits fast and accurate dialing of bandwidth and voltage level settings . . . now available at no extra cost as optional feature on G-E MLT-32 three-phase regulators rated 1000 kva and below.

The new Static Relay on General Electric's MLT-32 three-phase station regulator performs the function of a voltage-regulating relay . . . but there are no contacts to maintain or replace! Along with this reduction in maintenance, the new relay permits *fast* and *accurate* setting (on an easy-to-read calibrated dial) of bandwidths from $\pm\frac{3}{4}$ to ± 3 volts at all voltage levels from 105 to 135 volts. No more need for a reference voltmeter!

The new Static Relay maintains Class-1 accuracy and all other features of the present control.

This optional feature is available at *no extra cost* on General Electric MLT-32 three-phase station regulators rated 1000 kva and below. You'll want to know more about the MLT-32 and the new Static Relay; write to General Electric Company, Section 423-26, Schenectady, New York, or contact your General Electric Apparatus Sales Office.

General Electric Regulators Cost Less On The Line

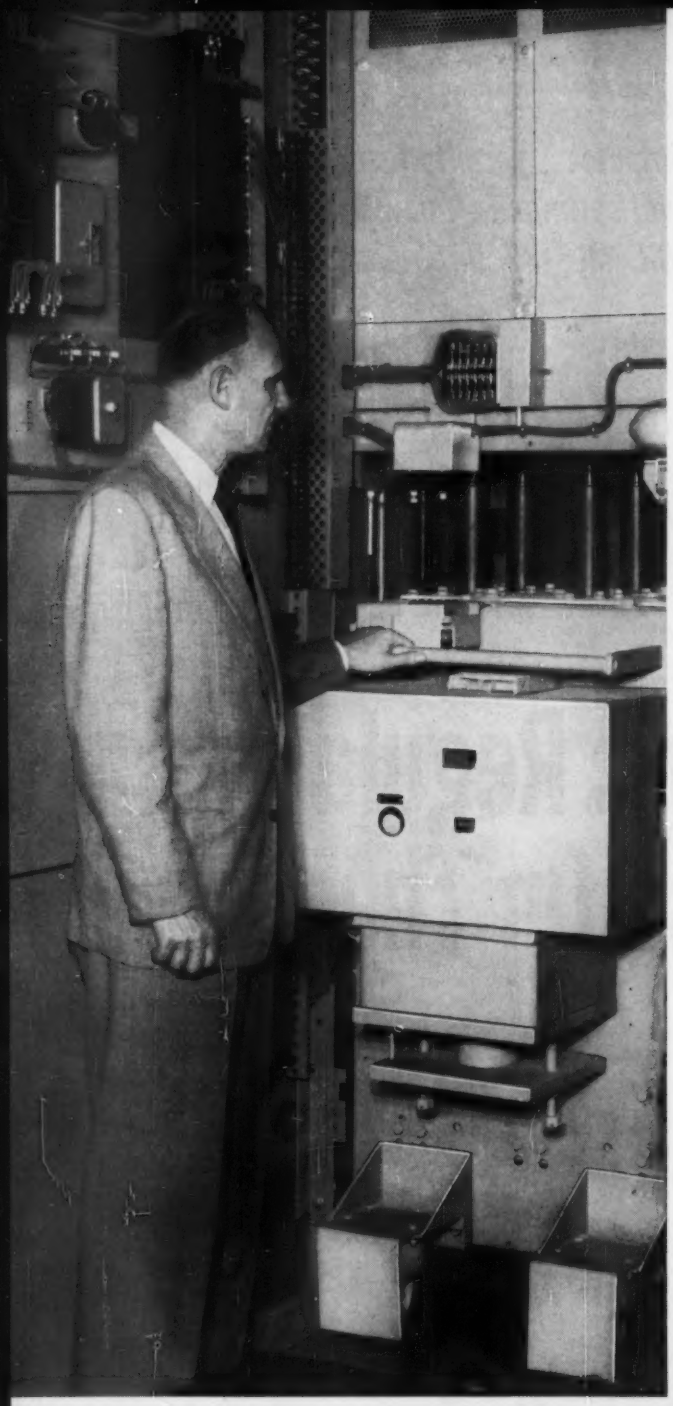


DIAL VOLTAGE LEVEL without having to check with a reference voltmeter. Accurately calibrated voltage levels clearly marked for fast, positive settings.

DIAL BANDWIDTH (from ± 3 volts down to $\pm 3/4$ volt). Accurately calibrated scale eliminates guesswork, shortens adjustment time to seconds.

Progress Is Our Most Important Product

GENERAL ELECTRIC



SAFETY YOU CAN SEE

With "visual break" design of circuit breakers used in G-E Metal-clad Switchgear

The man who operates General Electric Metal-clad Switchgear doesn't have to guess whether breakers are completely disconnected—he can ***actually see*** when primary disconnects are parted.

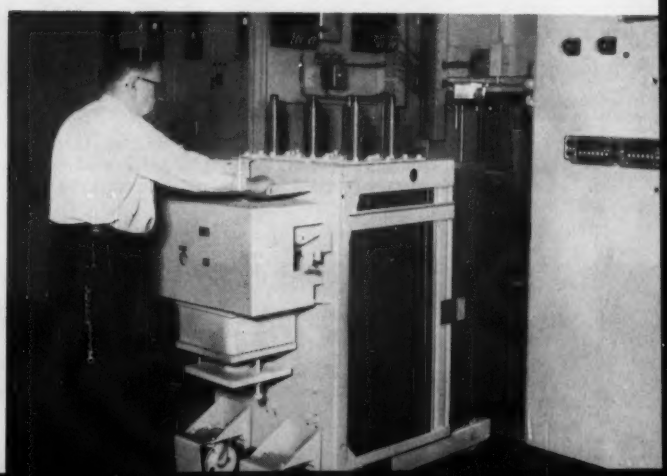
This tangible contribution to safety is made possible by General Electric's vertical-lift principle of operation. Because of vertical-lift, General Electric Metal-clad Switchgear provides "visual-break" safety for operators, plant and equipment.

Further safety is provided by positive interlocks which prevent raising or lowering the breaker unless it is open, and by shutters which automatically shield stationary contacts as soon as the disconnects part.

In addition to "visual-break," General Electric's vertical-lift operation gives you:

- minimized danger of breaker tip-over because of a lower center of gravity
- protection against non-functional hazards because arc chutes and mechanism are covered
- reduced replacement work and maintenance because contacts are protected from falling arc products which cause corrosion and pitting.

For details about the many other advantages of Metal-clad Switchgear, contact your nearest G-E Apparatus Sales Office. General Electric Co., Schenectady, N. Y. 511-29



"VISUAL-BREAK" OPERATION greatly simplifies breaker handling during inspection and maintenance. Operators can see when primary disconnects are parted—for safe breaker removal. Breaker's lower center of gravity minimizes the danger of breaker tip-over.

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GENERAL ELECTRIC

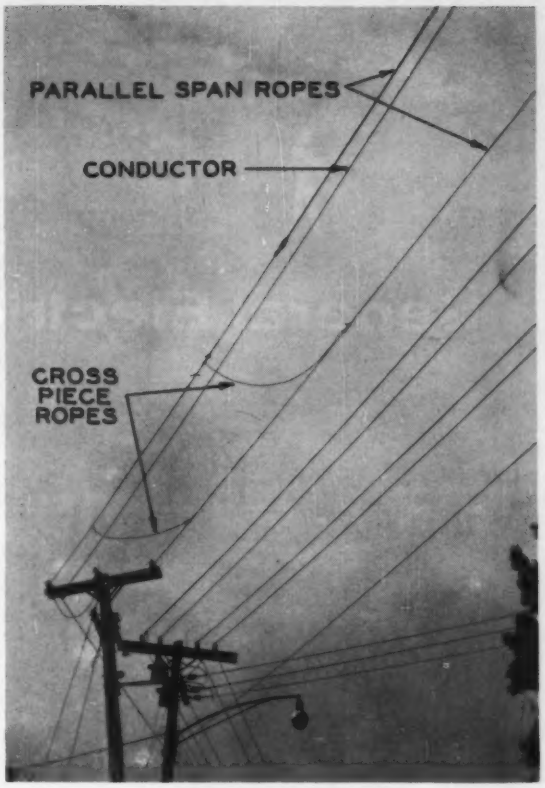
Rope Cradles Better Line Stringing Safety

B. E. BURNETTE, Line Foreman, Appalachian Electric Power Co, Roanoke, Va.

While lines are being strung over highways, the safety of employees and the public can be improved by using rope cradles. This scheme successfully prevents the conductors from sagging into traffic or other wires.

The cradles consist of two parallel ⅜-in. hand lines fastened to the outer insulator pins or crossarm ends with rope cross-ties at 10 to 20-ft intervals. Allowance is made for proper conductor sag.

The cradle is quickly installed in the span before the conductor pulling line is threaded through stringing blocks attached to the crossarms. Then the pulling line is raised and placed in the cradle. The cost is only that of the ropes and the time to position them.

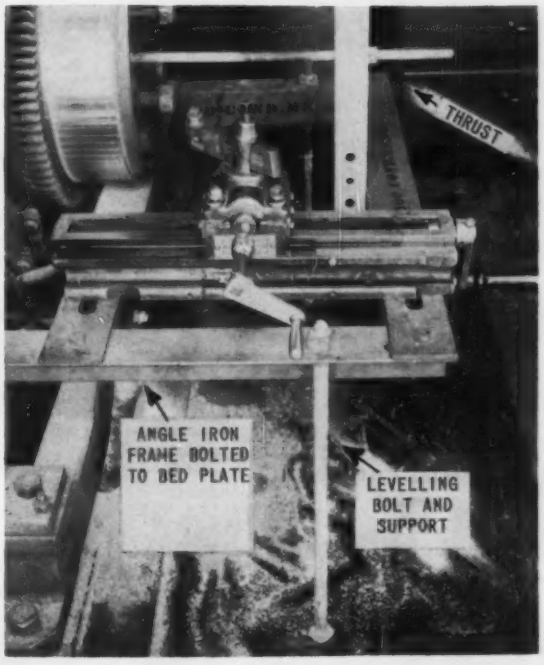


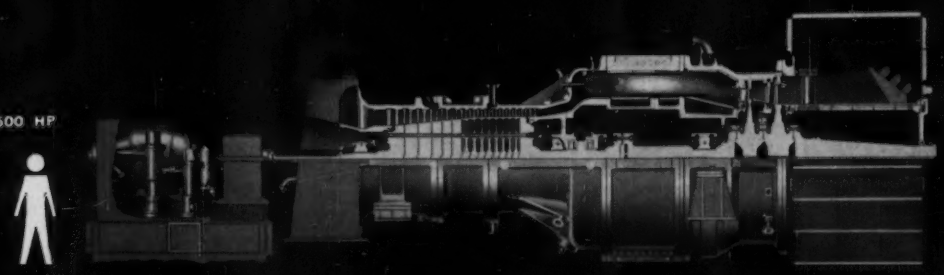
Cut Costs of Grinding Large Commutators

F. H. NYE, Substation Foreman, Ohio Power Co, Newark, Ohio

The task of grinding collector rings and large commutators can be simplified, with substantial savings in dollars and man-hours, by using a lathe and portable rotor-turner. This equipment produces satisfactory results and requires only one man to operate the lathe once the set-up is made.

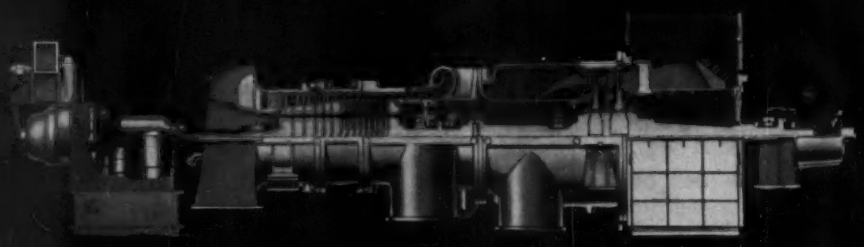
The 350-lb device which performs the important function of turning the rotor at a low constant speed consists of a 2-hp, 1-ph, 110/220-v, 1,750-rpm motor connected by twin V-belts to a 20:1 reduction worm gear which drives a drum at 32 rpm. The drum is connected by belts to the rotor shaft. Belt tension is adjusted and maintained by two hand-operated chain hoists attached horizontally between the base and anchoring points of the turning unit.



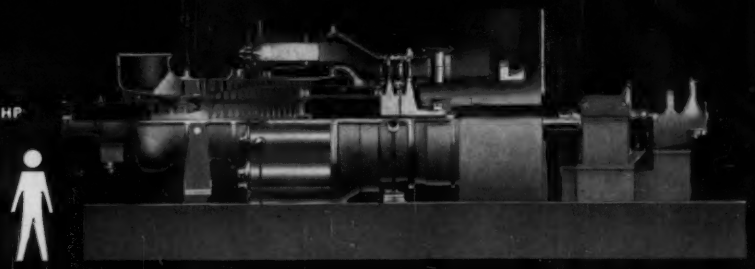


SIMPLE-CYCLE
16,500 KW; 22,500 HP

General Electric Gas Turbines Log.

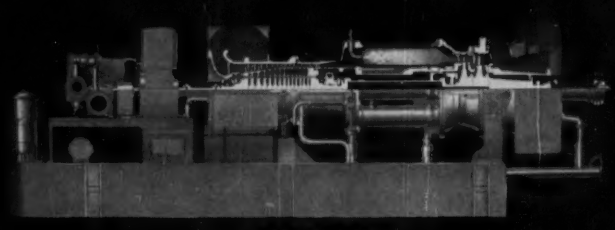


REGENERATIVE-CYCLE
15,200 KW; 20,900 HP

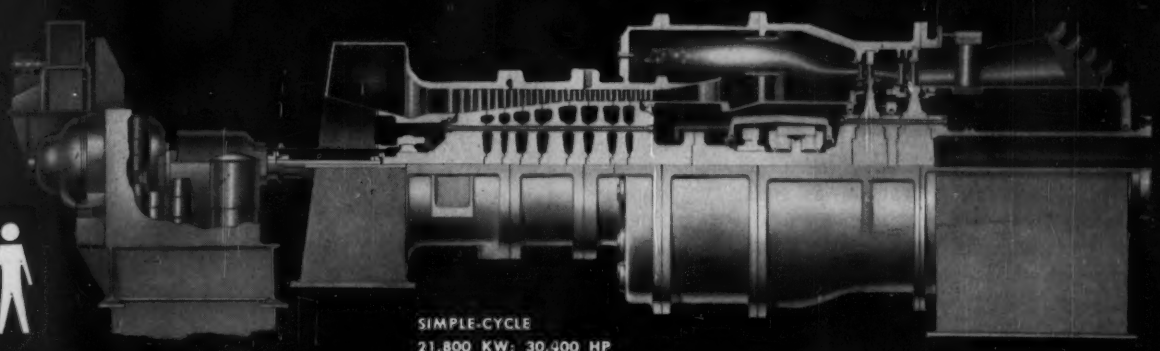


SIMPLE-CYCLE
9,500 KW; 13,400 HP

REGENERATIVE-CYCLE
5,400 KW; 7,600 HP



SIMPLE-CYCLE
5,300 KW; 7,500 HP



SIMPLE-CYCLE
21,800 KW; 30,400 HP

OPERATING EXPERIENCE, WIDE RANGE OF RATINGS OFFER NEW OPPORTUNITIES FOR INCREASING USE

. . . Over 2,250,000 Operating Hours

Over two-and-a-quarter-million operating hours recorded by 135 units in a wide variety of applications—this is the unduplicated performance record that has established General Electric gas turbines as increasingly important powermakers.

APPLICATION VERSATILITY is one of the primary reasons for wide gas turbine acceptance. By providing power, exhaust heat, or combustion air for use in process or in combination with steam turbines, these self-contained prime movers are able to satisfy a variety of power requirements. A brief look at the chart on this page shows the varied industries using General Electric gas turbines.

A BROAD RANGE OF RATINGS is now available. Units range from 6,700 to 30,400 horsepower and 4,750 to 21,800 kilowatts. Because gas turbines are more compact than conventional power plants, building requirements are simple and limited space is required.

Proven by operating experience, versatile General Electric gas turbines stand ready—now—for even broader application. Whatever your power, heat or process requirements are, why not get all the facts on this important power plant. For more information, contact your nearest General Electric Apparatus Sales Office or write for GED-3546 (Gas Turbines for Industry), or GED-3603 (Gas Turbines for Electric Utilities), General Electric Company, Section 261-31, Schenectady 5, N. Y.

GENERAL ELECTRIC GAS TURBINES POST IMPRESSIVE OPERATING RECORDS IN DIVERSE APPLICATIONS

APPLICATIONS	NUMBER OF UNITS*	TOTAL EQUIVALENT HORSEPOWER*	OPERATING HOURS
GAS AND OIL PIPELINE	88	574,800	1,185,000
LOCOMOTIVE DRIVE	58	462,890	500,000
ELECTRIC UTILITY	31	348,200	200,000
PETROLEUM AND CHEMICAL	20	191,450	50,000
OIL FIELD	16	155,400	300,000
GENERAL INDUSTRIAL (steel, rubber, paper)	5	76,200	10,000
MARINE AND NAVY	2	10,600	5,000
TOTAL	220	1,819,540	2,250,000

*General Electric gas turbines installed and on order as of February, 1958.

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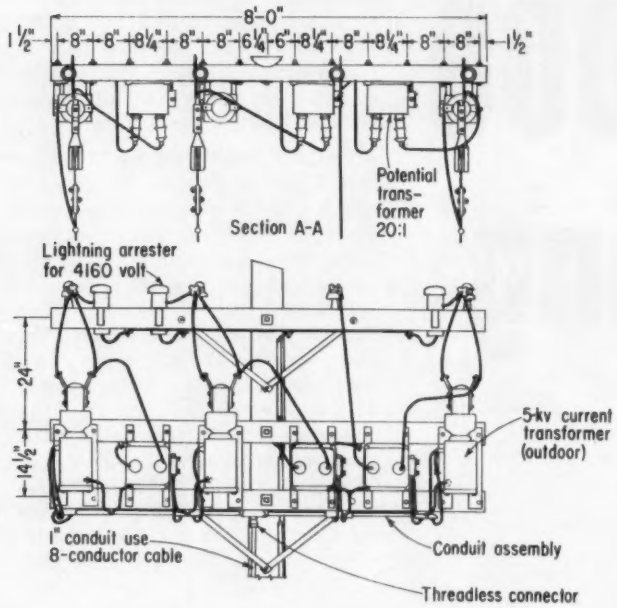
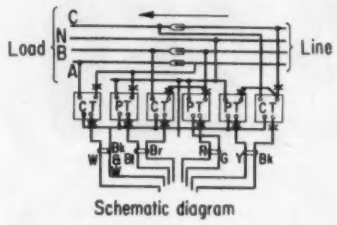
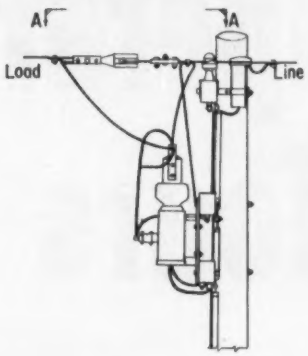
Instrument Transformers for Metering

Diagrams show installation arrangements of instrument transformers for outdoor 4,160-v, 8,320-v, and 12,470-v metering adapted from Distribution Specifications of West Penn Power Co.

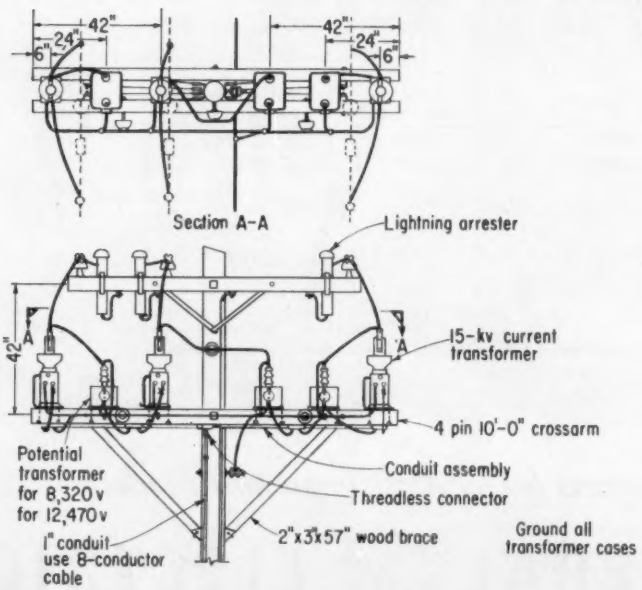
4,160-v Metering

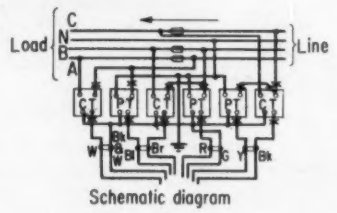


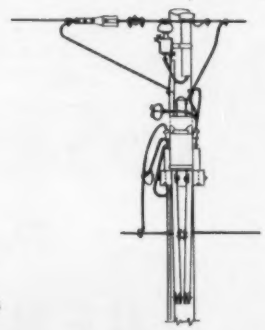




8,320-v and 12,470-v Metering







POWER PACK
250 or 400 watts
IES Type II, III, or IV

Another FIRST from the Outdoor Lighting Center of the World

NEW POWER PACK

Now—a 400-watt mercury luminaire with built-in ballast!

See what the POWER PACK offers you:

- **BIG DOLLAR SAVINGS** You no longer need a separate ballast. Or a transformer-base pole. Or a ballast adapter.
- **FASTER, SIMPLER INSTALLATION** Just make two terminal connections (instead of six or more). Fasten Power Pack to bracket. Move on to next pole.
- **EASIER MAINTENANCE** If there's an outage, you can check ballast and lamp from same ladder position. All ballast components are easy to get at, quick and simple to replace.
- **EASIER HANDLING, WAREHOUSING** Luminaire and ballast in one package, instead of separate and scattered about.
- **INTEGRATED, MODERN DESIGN** Power Pack is streamlined!
- **PREMIUM QUALITY** Same high lighting utilization you've experienced with the G-E Form 400—leader of the industry. In fact, Power Pack has 5% to 10% less power loss than conventional ballast circuit!

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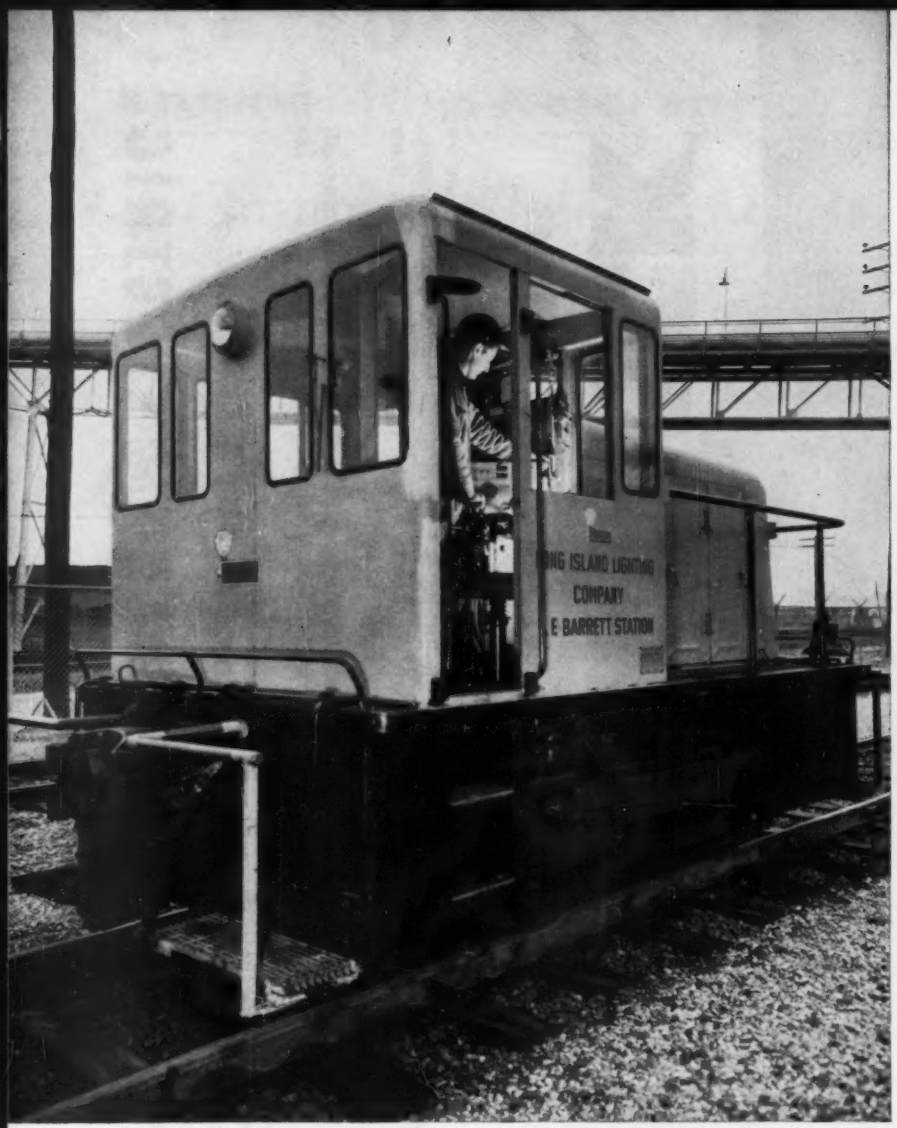
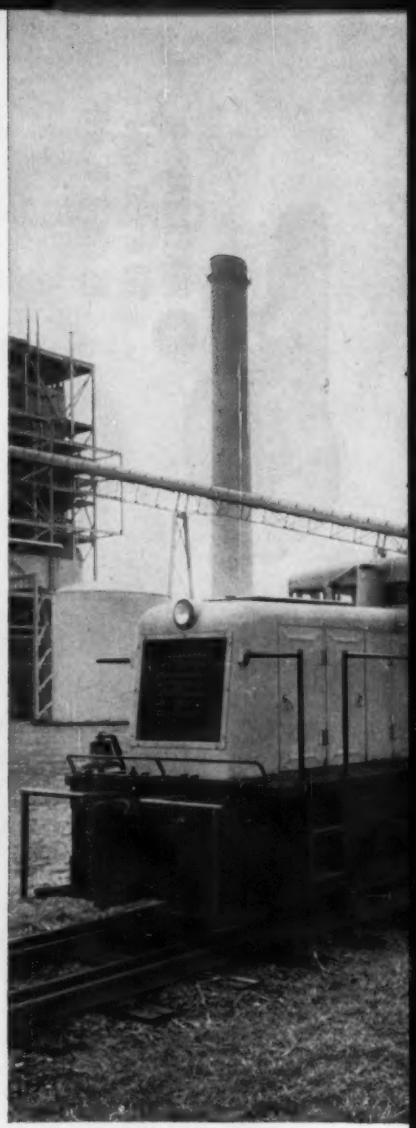
GENERAL ELECTRIC



A PUSH OF THE STARTER BUTTON starts up LILCO's 25-ton G-E locomotive on the coldest of mornings. Such efficient operation means high availability. LILCO Plant personnel like a unit that can be counted on for all haulage jobs.



FAST SWITCHING AND COUPLING of heavy coal cars is made possible by G-E Electric Drive. There's a smooth

Switching Generating Station Cars
With a General Electric Locomotive . . .

How 150 hp Helps LILCO Produce 156,250 kw

flow of power in LILCO's 25-ton diesel-electric locomotive because all components and operations are simple.

SUFFICIENT POWER IS AVAILABLE from LILCO's 25-tonner to meet all of the E. F. Barrett Generating Station needs. G-E Specialists helped LILCO choose a unit that would not waste power by carefully studying LILCO requirements.

The operation of Long Island Lighting Company's new 156,250-kw rated E. F. Barrett Generating Station in large part depends upon the efficient movement of materials. The movement of coal . . . the movement of heavy replacement equipment . . . the movement of generator parts during overhaul—all are key operations at the Barrett Station

For these many different material handling jobs, LILCO uses a General Electric 25-ton, 150-hp diesel-electric locomotive.

STATION OPERATING PERSONNEL like the ease with which their 25-tonner works. They like the high availability of their locomotive with its low maintenance and fuel cost. They like the use of G-E Electric Drive which results in fast, efficient locomotive operation.

LILCO MANAGEMENT is pleased with the performance of their new locomotive, too. The high return on their initial investment has proven to them that it was good economics to put a General Electric locomotive on the job.

A FREE SURVEY OF YOUR GENERATING STATION MATERIAL HANDLING REQUIREMENTS can show how you too could save with a General Electric Locomotive. For such a free survey, contact your nearest General Electric Apparatus Sales Office. Locomotive and Car Equipment Department, General Electric Company, Erie, Pa. 120-102

Progress Is Our Most Important Product

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DUDLEY SANFORD, president, Missouri Valley Electric Association, gave president's message at general session. Seated are Donald S. Kennedy, left, president, Oklahoma Gas & Electric Co, Paul L. Gunn, MVEA general chairman

MVEA Hears Sanford, Kennedy

Kansas City meeting told improved core steel cuts transformer noise; bundled conductors boost 138-kv capacities

Following a general meeting which featured Dudley Sanford, association president, and Donald S. Kennedy, president, Oklahoma Gas & Electric Co, the Missouri Valley Electric Association engineering conference at Kansas City, Mo., April 16-18 divided into groups for four simultaneous sessions on industry problems. The sessions dealt with accident prevention, metering, transmission and distribution system design and operation, power production, and other phases of the industry.

Will transformer noise problems be solved in the not-too-distant future through further improvement in core steel? This question was raised by L. W. Schoenig, Allis-Chalmers Mfg Co, in reporting that his organization had tested samples of steel having zero magnetostriction, the characteristic that causes noise, and low-loss characteristics. The samples, he said, were accidental, and Allis-Chalmers has gone to the steel company to see if they can be duplicated.

Bundled conductors will be installed on some short 138 kv lines out of the new Gordon Evans plant of the Kansas Gas & Electric Co, said O. R. Hantla. These lines will go in service in 1961, when the plant's first unit is scheduled for operation. Object of bundling is to increase line capacities.

Aerial surveys cost about the same and can be completed in much less time than ground surveys, said V. H. Anderson, Missouri Power & Light Co. The method also facilitates the buying of right-of-way, and its accuracy is greater than is required.

Cites Connector Tests

Development of SF_6 breakers for the highest interrupting requirements at 138 and 230 kv is under way, said A. W. Hill, Westinghouse Electric Corp. He said that he expected the breakers to be better and to cost less.

Immunity to moisture absorption, durability, light weight, lack of maintenance required, and high strength characterize fiber glass hot sticks, said P. H. McKinley, Williams & McKinley Sales Co. He described work by the Bodendieck Tool Co in developing the new hot sticks.

Such sticks, employed in regular line work for four years without maintenance, still tested 75 kv per ft for 5 min in the laboratory, he said.

Two or three grades of aluminum connectors will probably be recognized as a result of findings in tests conducted by Armour Research Foundation, under the sponsorship of the Edison Electric Institute. Such was the report of F. E. Sanford, chairman of the task committee of the EEI Transmission & Distribution Committee, under whose direction the tests were conducted. Sanford said that the committee is trying to be sure that connectors delivered in accordance with the new specification will do the job.

Chemicals painted in bands on branches and trunks of trees may retard growth and greatly reduce line clearance costs, said H. R. Johns, Asplundh Tree Expert Co. The chemicals used experimentally

(*Continued on page* 96)

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that last and last...

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"9000 Series" CONNECTORS

Fargo aluminum connectors also make a connection that last and last.

Featuring the unique, one piece vise type construction of all Fargo connectors, the "9000 Series" has extra width and mass. The longer contact areas overcome the high contact resistance inherent in aluminum, and the large mass provides ample radiating surfaces for rapid heat dissipation.

The pure, soft aluminum spacer bar insures a short low resistance path between conductors.

The "9000 Series" is available with grease loaded jaws, individually packaged . . . bimetal inserts . . . special spacers for wide range combinations, or with neoprene grommets on the spacer legs for hot stick installations.

Connector bodies are made of a high strength, age hardening aluminum alloy . . . aluminum bolts and washers are made to Fargo specifications which results in an aluminum connector that is durable, dependable, and makes connections that last and last.

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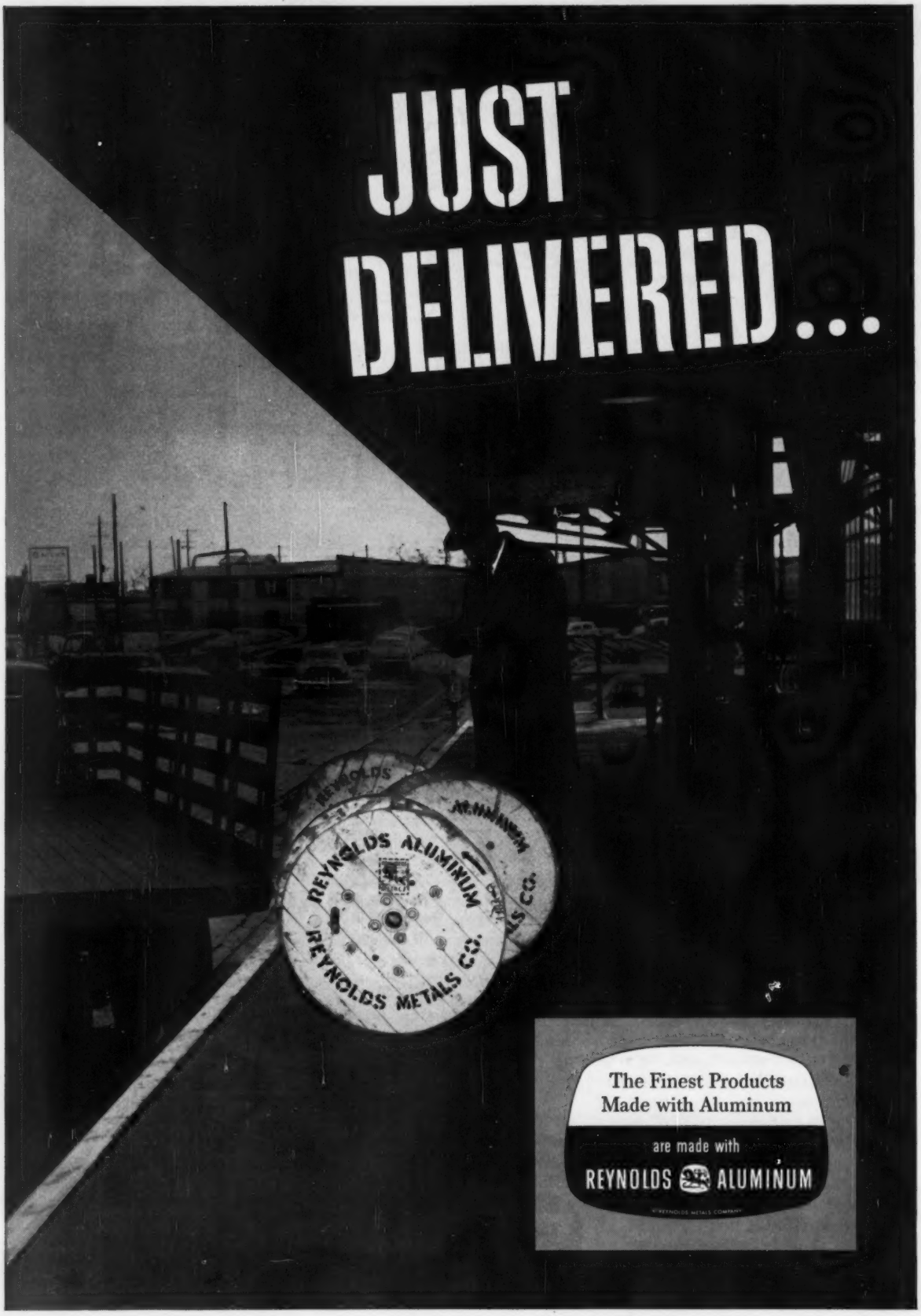
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MVEA Meets in Kansas City

(*Continued from page* 92)

are maleic hydrazide and polychlorinated benzoics.

Oklahoma Gas & Electric Co controls capacitors thermostatically, simulating the buildup of heat in the home by mounting the thermostat on a meter base and enclosing it in a glass meter case, said H. C. Denison. He added that 20% of the capacitors on the system are thermostatically controlled, and that there are 0.51 kvar of capacitors for each kw of system demand.

Stresses Alignment

Current-limiting reactors have been combined with reclosers to provide economical feeder protection, said H. A. Shinkle Jr, Kansas City Power & Light Co. A comparative cost study showed that such protection was slightly less expensive than the use of 10,000-amp cutouts or boric acid fuses.

Cost of 13.2-kv distribution will prove less than that of 4 kv in the long run, said F. P. Gilpin, Kansas City Power & Light Co. First steps of conversion were costly, said Gilpin, but, in his opinion, they just could not have gotten the expansion job done at 4 kv in time to meet load growth requirements.

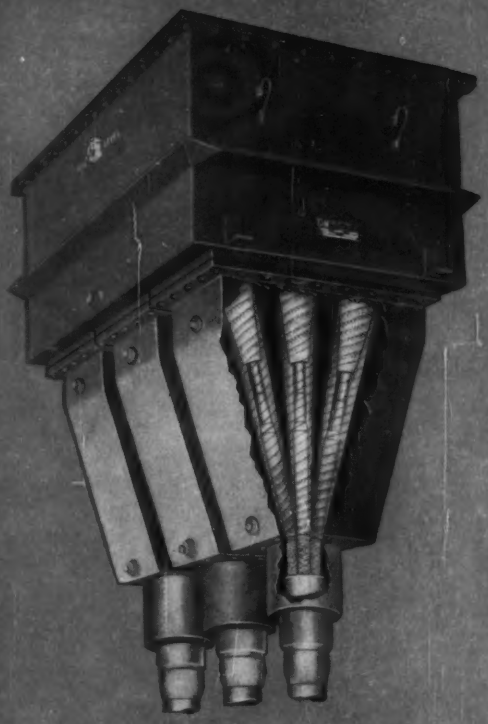
Many mysterious performance difficulties with large modern turbine generators are due to undetected alignment changes, said E. A. Rudolph, Union Electric Co. He described a method of aligning by using a highly accurate engineer's level. Accuracy is ± 0.001 in. Alignment can be checked with a unit on the turning lathe, and changes in alignment from cold to operating temperature are important, Rudolph said.

Replacements Cost Less

Rising costs of generating capacity have been largely overcome by going to larger generator sizes where cost per kw of installed capacity is lower, said R. W. Dodson, Southwestern Gas & Electric Co. Larger units tend to reduce operating costs through improved heat rates and reduced labor costs. But more reserves must be carried, transmission requirements may be affected, and more spinning capacity is sometimes needed.

(*Continued on page* 98)

INVESTIGATE THESE REASONS FOR USING OIL FILLED LINK BOXES



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- **Point of access for phasing or fault location**
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- **Specialized skill generally required for making wye joints is reduced to normal skill needed for straight joints or pothead installations**

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Illustrated above: Oil filled box with gas filled cable-heads and stud bushings—3 way, 3 pole, 34.5 kv, 500 mcm, LPGF cables. (Available also with hermetically sealed potheads—either may be filled with compound, oil or gas.)

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PIONEER PRODUCERS OF PLASTIC INSULATED WIRES AND CABLES

MVEA Meets

(*Continued from page* 96)

When the Empire District Electric Co replaced boilers in its Riverton, Kan., plant, pressurized boilers were chosen because initial costs were less, said R. M. Scrivener and A. R. Puffinbarger. Reduced costs revolved chiefly around elimination of the induced draft fan.

A 10 to 1 advantage in speed was recorded in calculating meter compensator settings with a small digital computer over calculations without a computer, said I. G. Chronister and H. K. Eshelman, Kansas City Power & Light Co. A large computer showed a 40 to 1 time advantage but only a 5 to 1 cost advantage. Calculation of compensator settings is necessary when metering is on the low-voltage side of the transformer and billing is a primary metering rate.

One revolution meter testing with an automatic print out which indicates meter accuracy to within 0.1% appears to be the best method yet developed, said N. R. Rogers, Commonwealth Edison Co. It eliminates human errors, saves space in the meter shop and office, paces the operator, and is less fatiguing.

Meters are tested in a field laboratory by the Missouri Utilities Co, said Walter Moeller. The laboratory consists of a house-type trailer equipped for testing and making minor repairs. A three-man crew has tested up to 1.67 meters per manhour.

Street lighting is improved at moderate costs in many communities on the Missouri Utilities Co system by converting to small open-type units adaptable to incandescent or mercury vapor lamps, said H. W. Nussbaum.

Public Service Electric & Gas Co construction expenditures for 1958 are expected to aggregate about $160 million. The company has two major stations under construction—Bergen generating station at Ridgefield and Mercer plant on the Delaware River near Trenton. Initial operation of the Bergen station is planned for early 1959. Its total capacity will be 580,000 kw. First installation at Mercer will be a 320,000-kw unit scheduled for operation in 1960.

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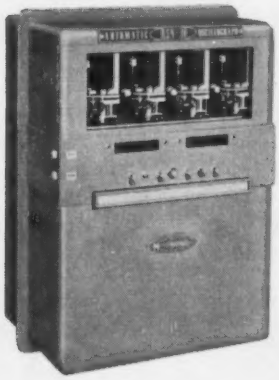

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. . . provides proof of sequence of relay and breaker operation . . . a permanent, accurate record of what happens when a fault occurs.

The Hamilton Oscillograph, RS-9 Thirty, provides constant vigilance over your high voltage lines. It shows when a relay or breaker protecting the line is slow acting or erratic...often indicating faulty equipment before it can cause costly down-time.

The RS-9 Thirty stands by, constantly monitoring your system with as many as 32 channels. Then, within 2 milliseconds after a fault occurs, it is automatically at work recording the transient wave forms, giving you a sharp, easy-to-read record of everything that happens to your system for the duration of the fault.

Also available—a 14 channel automatic oscillograph, RS-9 Fourteen; and an automatic record developer, SD-10.

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Send for an actual chart recorded by an RS-9 Oscillograph. See for yourself how easily the chart can be analyzed. Mail the coupon TODAY.

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"Creative engineering," as it applies to Tobe, has two meanings. First, it means the factory-supervised field attention we give to a customer's specific power capacitor problem (like the tricky Monel Metal cases we helped work out for a "flood-proof" manhole installation). "Creative engineering" also aptly describes the research, design and quality control innovations Tobe has developed at its modern Norwood, Mass. plant.

For instance:

• Unique Tobe control procedures which assure thermal stability (This is why we call them "Tempall" Capacitors.) • Self-locking neoprene terminal caps* • Stainless steel case, at no extra cost • Special clamp arrangement with vibration-proof nylon-insert stop-nut on line hardware • Discharge resistors across each series group • Low losses to give you more correction for your dollar (see below).

Investigate Tobe Tempall Capacitors today. Available in all standard ratings: in single units, racks, pole assemblies and cabinets.

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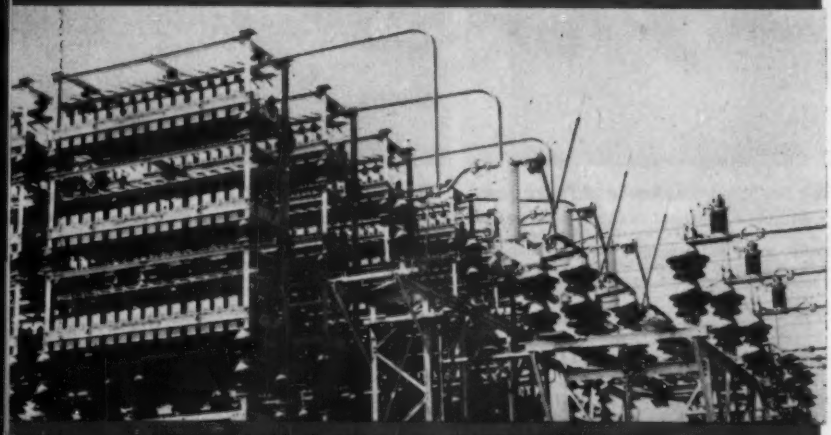
in action



AVERAGE LOSS IS ONLY 1.22 WATTS/KVAR at 480 Volts, 60 Cycles, Electric California Substation of the Bureau of Reclamation. Tobe's unique method of impregnation allows individual control over each unit, contributes to this remarkable performance. (NEMA standard is 4.4 WATTS/KVAR.)

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*Patent Pending

Books

Electricity and Magnetism

Basic Electrical Engineering. **By Robert H. Nau. Published by Ronald Press Co, 15 East 26th St, New York 10, N. Y. 437 pages, illustrated. Price $7.00.**

Fundamental concepts and basic definitions of electricity and magnetism are the topics of this text. It is intended as a first course in electrical engineering. Prerequisites for its use are basic mechanics and one semester of calculus.

Solution of networks is treated rather thoroughly by the author. Atomic theory of magnetic domains, a topic generally not found in elementary text books, is also treated in this book. Two full chapters are also devoted to alternating current circuits. The book presents an exceptionally broad coverage and should give students a firm foundation.

Practical Transformer Guide

Medium Size Transformers. **By Samuel Heller. Published by Datarule Publishing Co, Box 69, Scarsdale, N. Y. 208 pages, illustrated. Price $25.00.**

The emphasis of this book is on the practical application rather than on basic theory. Material is presented on testing, reconnecting, elementary design, and winding of medium-sized (100 kva or less) transformers. All of this material is presented in simple language. In addition to material on regular and autotransformers, the author has included a chapter on the design and construction of potential and current transformers and saturable core reactors.

This book should be useful to shop repairmen.

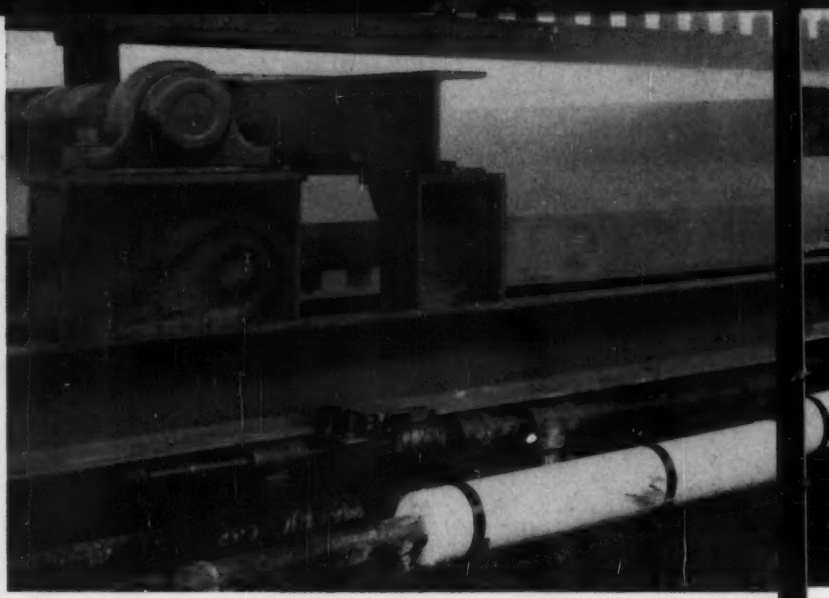
Electrical Machines Explained

The General Theory of Electrical Machines. **By Bernard Adkins. Published by John Wiley & Sons, Inc, 440 Fourth Ave, New York, N. Y. 236 pages, illustrated. Price $8.00.**

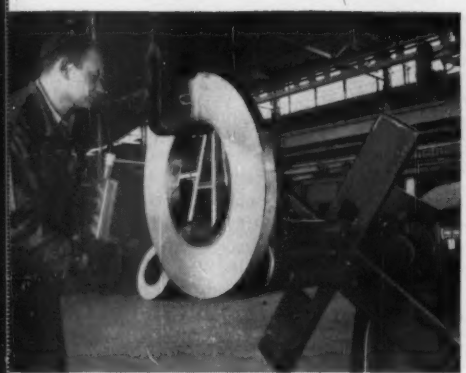
The development of a general theory of rotating electrical machines applicable to all normal types of machines and to all conditions of operation is the thesis of this next. General equations for idealized machine are first introduced and then refined for use with both dc and ac machines.

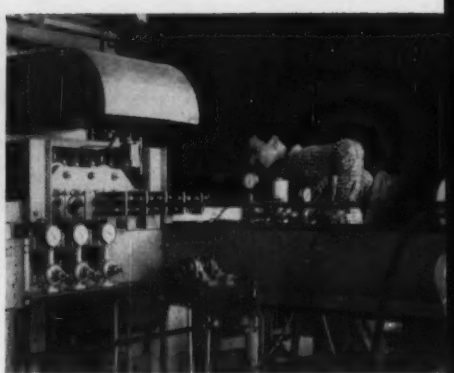
This is a British text but much of the material is derived from AIEE papers. The author has done an excellent job of gathering and co-ordinating valuable but scattered data.

Matrix algebra and Heaviside operational calculus are used sparingly but to a large enough extent to require knowledge of them. This volume is strictly for the graduate student or the machine designer.



NEWS! Now Circle's





Proper steel plus!

The best cold rolled steel, unless properly fabricated and finished, will lose its ductile properties. Circle processes are designed to retain the natural bendability of the selected high grade steels it uses for CIRTUBE EMT.

Better welding makes a difference!

Note how ordinary EMT split early in pressure test while induction welded CIRTUBE EMT held fast, surpassing minimum UL requirements. High frequency induction welding not only means bead-free welds for easier fishing—but stronger tube as well.

The fishability is all in the finish!

You need more than a slick surface to make wire pulling easy. You also need a sort of built-in lubrication. A baked-on protective coating containing special wax-like ingredients gives CIRTUBE EMT this property.

Lifetime exterior finish!

No matter how severe the bends, there's no chip, no flake, no peel. The galvanized finish is hard for durability; has a polished satin lustre for lasting good looks. A completely automatic, electronically controlled process guarantees this uniform protection.

Automated quality control!

Very little has been left to human error in the manufacturing control of CIRTUBE EMT. Wherever possible, completely automatic controls have been built into equipment to assure contractors complete and continuing uniformity of product.

Tight, easily handled bundles!

Circle has automated every possible operation to make your job easier. Bundling, for example, is completely automatic. Distinctive orange colored tapes identify CIRTUBE EMT, hold bundles securely together for easier handling on and off the job.

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New plant, ultra modern equipment, special techniques combine to produce new CIRTUBE EMT — unsurpassed for quality and workability

IT TOOK well over two years of extensive research to develop CIRTUBE EMT *

First we surveyed the needs of the contracting industry. Then we investigated the latest manufacturing methods and techniques, examined available equipment and materials — even hired a famous consulting engineering firm to design special machines.

Behind all of this we put Circle's 37 years of know-how and skill developed in manufacturing a top quality line of building wire and cable.

PURPOSE: to produce EMT with the right combination of bendability, fishability, durability, and appearance.

The final result is CIRTUBE EMT — a quality electrical metallic tubing that permits contractors to make better, faster, more profitable wiring jobs.

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* T. M.

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DEDICATION participants at Lehigh U: Prof. J. J. Karakash, EE dept head; H. L. Buck, I-T-E general manager; Dr. H. A. Neville, provost; L. V. Bewley, dean College of Engineering; G. E. Heberlein, v.p. engineering, I-T-E

College Gets I-T-E Analyzer

An electric network analyzer, reportedly the first designed specifically for engineering education, has gone into service at Lehigh University. Bethlehem, Pa. It is a computerlike unit that can simulate the power system of a public utility and was built by I-T-E Circuit Breaker Co, Philadelphia, Pa.

The analyzer was dedicated May 1 at a "patchboard ceremony" at Lehigh's Packard Laboratory, where the room-size unit will serve as a laboratory tool for engineering students and faculty, and for utilities and industrial firms.

To dedicate the analyzer, the first patchboard, the plug-in device that programs the analyzer for a specific study, was inserted by Professor J. J. Karakash, head of Lehigh's department of electrical engineering, and G. E. Heberlein, I-T-E vice president, engineering.

First to use expandable, building-block design developed for colleges and small private users by I-T-E, the Lehigh analyzer will let engineering students tackle electric power generation and distribution problems similar to those handled by public utilities on much larger and more complex network analyzers.

The analyzer will also be used by Lehigh faculty for advanced study and in connection with system problems encountered by local industry and power company engineers.

The basic-unit analyzer includes three generators and 24 circuit elements, a combination which is ideal for laboratory investigation of small power systems. Lehigh's analyzer incorporates six generators and 62 circuit elements. If future expansion is desired, the basic unit control center can accomodate up to 21 generators and 400 circuit elements, extensive enough to permit analysis of a large electrical system.

The $75,000 Lehigh unit, 7 ft high, 2 ft deep and 13 ft long, can thus eventually be expanded into a huge network analyzer which might cost as much as $200,000 or more.

In summing up the significance of the new analyzer, Professor Karakash said. "Acquisition of a network analyzer by Lehigh University is a scientific boost toward the improvement of the teaching of courses in the field of electric power."

L&N and Philco Share in Computer Program

Leeds & Northrup Co and Philco Corp, both in Philadelphia, Pa., have launched a shared cost program to design and build a digital computer. Development work has started and field trials of a prototype computer system is anticipated during 1959.

Applications of the computer-control system are the economical operation of electric power plants, atomic energy processes, steel mills, industrial processes, also scientific and engineering computation including data processing.

Nine Silicon Rectifiers Go to New England Area

Nine 250-kw silicon rectifiers have been shipped to the New England area by Richardson-Allen Corp, College Point, N. Y.

The original order called for four completely-sealed silicon rectifiers which were used in a trial installation with a selected group of residential and commercial customers. The rectifiers are designed for a nominal rating at 208-v, 3-phase, 60-cycle input, and 250-v, 1000-amp d-c output. Efficiency is reported to be 98.5% at full load and 0.98 power factor. Each unit has 60 separate silicon diodes contained in an oil-filled, all-welded steel tank. Dimensions are: 83 in. long, 45 in. wide, and 85 in. high.

Designed to be interchangeable, the manufacturer states that these units can be relocated for use in other areas when they are no longer required where initially installed.

Burndy Library Publishes New Bern Dibner Book

"Agricola on Metals" by Bern Dibner, a distillation of "De Re Metallica" by Georgius Agricola, an encyclopedic record of the mining

(*Continued on page* 106)

Connect
COPPER with COPPER
ALUMINUM with ALUMINUM
use...

PAC-5
ACSR 6—1/0 Cu. 8—1/0

PAC-3
ACSR 8—2 Cu. 8—2

PAC-4
(formerly PAC 6—0)
ACSR 6—1 0 Cu. 6—2

PAC-7 (replaces PARC 6—0)
ACSR 1 0—336.4
6—1 0 A R Cu. 8—1 0

BLACKBURN COPPER TO ALUMINUM FITTINGS

BLACKBURN PAC CLAMPS

ELIMINATE CORROSIVE SOLDERS, VOIDS AND FLUXES !

There are many satisfactory copper connectors for connecting copper conductors.

There are many satisfactory aluminum connectors for connecting aluminum conductors.

Blackburn's PAC clamps combine the features of a good copper connector and a good aluminum connector to give you the best copper to aluminum connector available.

Our exclusive method (Patent applied for) of pressure casting molten corrosion resistant aluminum alloy around specially treated pronged copper liners establishes an intimate, low resistance contact of the two metals without using corrosive solder.

The copper liners, which cannot be mated incorrectly, surround the copper conductor establishing a good copper to copper contact.

The aluminum grooves surround the aluminum conductors, establishing a good aluminum contact.

Adequate contact surface and conductor separation is built into Blackburn's PAC clamps to insure long-lasting, trouble-free copper to aluminum connections without setting up cold flow or galvanic corrosion.

Spring action is inherent in the design of PAC clamps and is supplemented with an extra-heavy spring lockwasher insuring permanently tight connections which will withstand temperature fluctuations.

Hot dipped galvanized steel hardware is standard. Aluminum hardware available on all but Catalog #PAC-3.

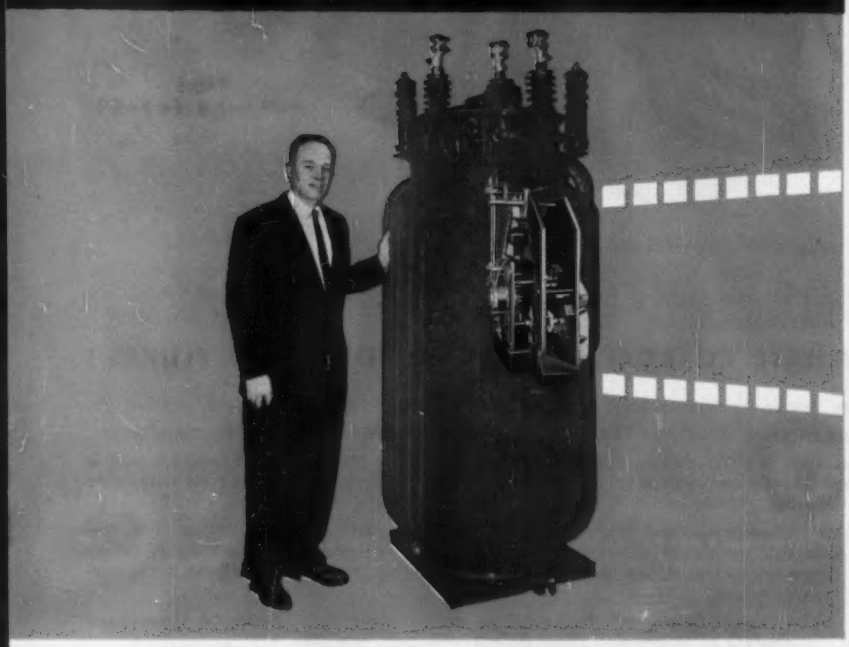
AVAILABLE THROUGH ELECTRICAL WHOLESALERS EVERYWHERE

JASPER BLACKBURN CORPORATION

1525 WOODSON RD., ST. LOUIS 14, MO.
WYdown 3-9430

Ask your
Westinghouse representative
about the exclusive benefits
you get from

URL AND URF
REGULATORS...WITH THE
TAP CHANGER THAT'S
15 TIMES FASTER



Westinghouse URL and URF regulators are equipped with a direct-drive Geneva gear tap-changing mechanism. The motor-driven mechanism operates instantly when a tap change is called for, thus taking advantage of the inverse time characteristics of the computing type CVR relay control.

This direct-drive mechanism corrects voltage 15 to 20 times faster than any spring-driven mechanism. Because there is no wind-up time, full-range operation requires a maximum of only 13 seconds, compared to 3½ to 5 minutes for other drives.

Elimination of this unnecessary time delay allows a 1½-volt correction in only 1 second, assures a narrower effective bandwidth, with better voltage control and improved customer service.

See your Westinghouse representative for the full story of better regulation—made possible through PLOWBACK OF EARNINGS into research . . . to help solve the immediate and long-range problems of the electric utility industry.

J-70860

YOU CAN BE SURE...IF IT'S Westinghouse

Dibner Book

(*Continued from page* 104)

and metallurgical industries of 16th century Germany, has been published by the Burndy Library, Norwalk, Conn.

The 128-p book reproduces over 70 selected illustrations from the original edition in the Burndy Library. Price is $2.50.

British Electrical Show Rated Huge Success

The Seventh Annual Exhibition, sponsored by electrical equipment manufacturers in Great Britain and held in London, is considered a "snowball of success", according to a recent report.

Highlights of the show included: Emphasis on various kinds of nuclear power stations; increase in the number of makers of distribution transformers and 600-v switchgear; pronounced trend towards floor heating by five slightly different systems; and a swing towards silicon for power rectifiers. A gallery was devoted to electrical engineering education.

This exhibition was held in the largest covered building in Britain, at Earls Court. The report noted that there were over 350 stands, representing 420 organizations. Area occupied was 450,000 sq ft. Attendance was 65,000 people, all from the industry, because the public was excluded.

Stephenson-Adams Designs Coal Handling System

A coal handling system which moves 1,100 tons of coal per hour has been designed and engineered by Stephens-Adamson Mfg Co, Aurora, Ill. for the River Rouge Power Plant of The Detroit Edison Co. The system also handles 2,500 tons of coal every 60 min from ships and barges to a 1,800,000-ton capacity storage yard.

The system is completely automatic in operation. Two men control the flow of coal from dock hopper to storage yard or to the bunkers in the power house. One operator in the breaker house controls the

system from the dock hopper, or to the second transfer house on its way to the power house bunkers. A second operator controls the coal flow from the second transfer house, along the distributing conveyors, to the self-powered tripper feeding the bunkers.

English Company Formed To Administer Contract

The English Electric Co Ltd, Babcock & Wilcox Ltd, and Taylor Woodrow Construction Ltd have formed a new company, The English Electric, Babcock & Wilcox and Taylor Woodrow Atomic Power Construction Co Ltd.

This company has been formed to administer the contract for the nuclear power station at Hinkley Point in Somerset, England, the construction of which started last fall. The contract will be carried out by the three companies of the group under sub-contracts with the new company. Hinkley Point, when completed, will reportedly be the largest nuclear power station in the world, with a net electrical output of 500,000 kw.

Directors of the new company will be: H. G. Nelson, English Electric; H. McNeil, Babcock & Wilcox; and F. Taylor, Taylor Woodrow Construction.

A. B. Chance Establishes Earth-Anchor Award

The "Anchor Hall of Fame" Award, to give recognition to individuals who have made outstanding contributions to the earth-anchor field, has been established by the A. B. Chance Co. The award is dedicated to the memory of the late A. B. Chance, the company's founder.

The first award was made recently to Jackson T. Isbell, assistant to the president of the Chance Co, "for his contribution in the development of the Wej-Lock Anchor, his ideas for improvements in the Chance Steel 4-Way Expanding Anchor, and for his major contribution to the sales of all anchors."

Award winners are selected by the Board of Directors of the Chance Company. The award is not limited to company personnel.

Allis-Chalmers Reports on Recent Developments

• There is evidence to assume there will be an upturn later in the year in the composite Index of Industrial Production, R. S. Stevenson, president of Allis-Chalmers Mfg Co, recently told the New York Society of Security Analysts. "We are gearing ourselves accordingly," he said.

• A-C output has been running in line with 10 to 12% dip of the index this year, Stevenson said. Factors that promote his optimism include a backlog of heavy electrical generating apparatus running "well into 1960"; farm equipment sales that are ahead of 1956; and anticipated outlays for highways, public works, and housing.

The company will spend over 5% of its sales dollar for research development and engineering during 1958, he said.

• A one-man method for handling continuously-wound transformer coils, utilizing conveyors and a specially designed hydraulic coil upender, has been placed in operation at the Pittsburgh works. The system reportedly reduces over-all handling of the coils by about one-third.

The up-ender turns the coils from a horizontal to a vertical position and then they are conveyed through the drying oven and coil press to the loading area.

• A design change in the stationary element of the Allis-Chalmers 13.8-kv metal clad switchgear has been effected recently. It results in more positive and smoother action of the automatic, protective shutter covering primary disconnect orifices, according to a company spokesman.

Linked to the breaker drawout mechanism, the shutter is automatically closed when the breaker is withdrawn. When the breaker is placed in the switchgear cubicle, it engages the drawout mechanism and, as it is moved to the operating position, the shutter is raised to permit contact between the movable and stationary disconnects.

The shutter moves in roller bearing guides instead of metal tracks, insuring smooth, trouble-free operation, and eliminating the possibility of the shutter jamming in the tracks.

The operating rod connection was moved towards the center of the shutter for improved balance operation.

EXCLUSIVE DIRECT-DRIVE GENEVA GEAR MECHANISM...

* No shock
* Fast arc extinction
* 15% less contact erosion

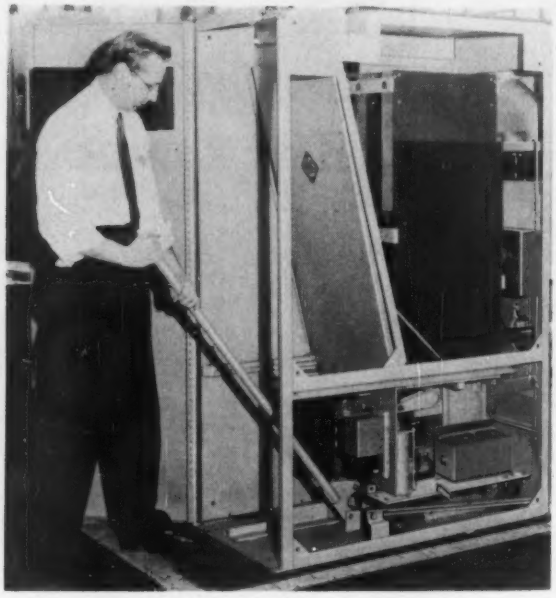
The exclusive direct-drive Geneva gear tap-changer mechanism in URL and URF regulators provides a sinusoidally controlled motion which:

- Changes taps smoothly, with no mechanical shock to loosen components.
- Provides correct speed for arc extinction.
- Reduces contact erosion by 15%.
- Permits 1¼% steps, which improves regulation and cuts maintenance.

J-70859

YOU CAN BE SURE...IF IT'S Westinghouse

New Equipment



Metal-Clad Switchgear . . .

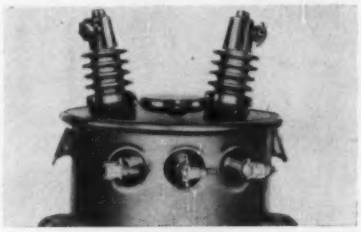
. . . provides 2-cycle operation for 4.16-kv systems. Type D horizontal drawout equipment is only 72 in. high, has eye-level instrumentation, and needs 10 in. less aisle space than predecessor. Breaker can be moved from disconnect to connect in less than 15 sec. Switchgear can be used indoors or outdoors.

Spirally wound toroidal or window current transformers have fully compensated secondary. They mount in front of separately grounded metal barrier, accessible from breaker compartment, and can be changed without deenergizing main bus or disturbing insulated bus work. Standard carriage, mounting up to three potential transformers or 15-kva control transformer, rotates 180 deg to automatically grounded disconnect position. Flame retardent glass polyester insulation is used on bus bar supports, primary bushings, and bus connection caps. Cable compartment serves any type of cable, direction, or termination.

Allis Chalmers Mfg Co, Milwaukee 1, Wis.

Bushing and Terminal . . .

. . . protects distribution transformers up to 167 kv from bird and squirrel damage. It is available for 1-phase or 3-phase units in ratings



from 5,001 through 16,500 v. Phenolic insulating cover threads on end of high voltage terminal. Small slot in side of guard between arrester and terminal electrodes provides necessary gap for protected transformers. Terminal clamps are tightened by hand knob; no wrench is needed to fasten conductor in terminal. For bare copper, bakelite tube attaches to insulating cover.

Wagner Electric Corp, 6400 Plymouth Ave, St. Louis 14, Mo.

Fused Cutout . . .

. . . features bird-proof construction and cadmium coated terminals in redesigned model. Designed for rural and distribution lines, the Protecto-Link is made in 7.5 and 15-kv, 50 amp models. Insulator clamping bolt, holding insulator assembly to mounting bracket, is coated with vinyl resin to prevent birds from grounding circuits. Cadmium plated, pressure-type upper and lower terminals take No. 6 solid copper to No. 3/0 ACSR or 4/0 7-strand copper.

A. B. Chance Co, Centralia, Mo.

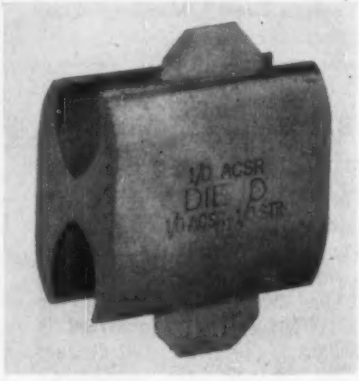
Protected Aisle . . .

. . . for outdoor metal-clad switchgear rated 2.4 to 13.8 kv, with interrupting ratings from 75 to 1,000 Mva, is offered as optional equipment. Aisle has one-piece construction. Reinforced steel floor, at same level as metal-clad floor, permits breaker removal and servicing. Breakers can be passed side-by-side within enclosure, eliminating need for transfer truck. Doors at either end of aisle may be locked. Three-way switch at each entrance controls interior fluorescent illumination included with the aisle.

General Electric Co, Schenectady 5, N. Y.

Compression Connectors . . .

. . . for use where tap is larger than line wire can be used for dead-ending and tapping on all combinations of aluminum, ACSR, and copper.



Either groove of Squeezon may be used for tap or line wire. For dead-ending, unit is installed after loop has been formed, without threading. Groove sides are open and parallel, with fold-over retaining tabs. Connectors are installed with mechanical or hydraulic tools. Grooves are normally treated with inhibitor.

James R. Kearney Corp, 4236 Clayton Ave, St. Louis 10, Mo.

(More New Equipment on page 112)

UNIFORMITY

"VICTOR SUSPENSIONS—

**NOT ONLY LOOK ALIKE—
THEY PERFORM ALIKE,"**

*says Robert L. Perry,
Factory Manager,
Victor Insulators Division,
I-T-E Circuit Breaker Co.*

Why try to cut corners with suspensions whose mechanical and electrical characteristics may vary all over the lot? Be sure of uniformity with VICTOR Suspensions. They are made by the carload, year after year, yet each insulator is identical. Each has a built-in margin of safety that precludes failure on the line.

Big reason for this amazing uniformity is Purified Porcelain. This porcelain is denser, harder, stronger, has greater uniformity than any insulator porcelain ever made! Segregation and analysis of each shipment of raw material, scientific proportioning of ingredients, demineralization of all processing water and the use of densitizing pug mills make Purified Porcelain possible.

These processes together with quality-controlled manufacturing, and rigid, routine testing techniques make truly superior insulators. You just can't buy better suspensions—at any price!

I-T-E CIRCUIT BREAKER COMPANY
VICTOR INSULATORS DIVISION
Victor, New York

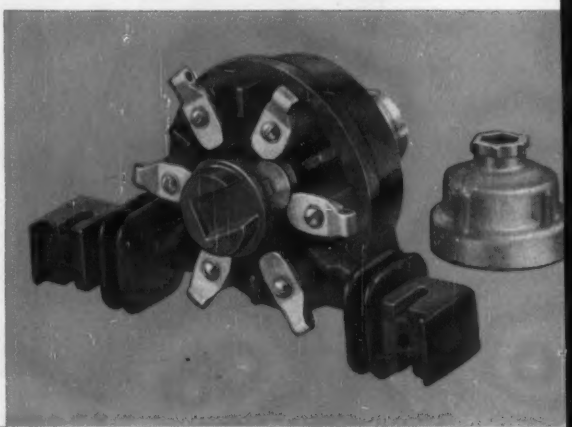
..... if you use

Eliminate costly, time-wasting, dangerous steps

with the externally-

RT & E TAP

The industry—famous RT & E Tap Changer has been redesigned, and repositioned on the tank, for even greater ease in tap setting, speed and convenience in changing tap positions.



FAST 1-2 ACTION

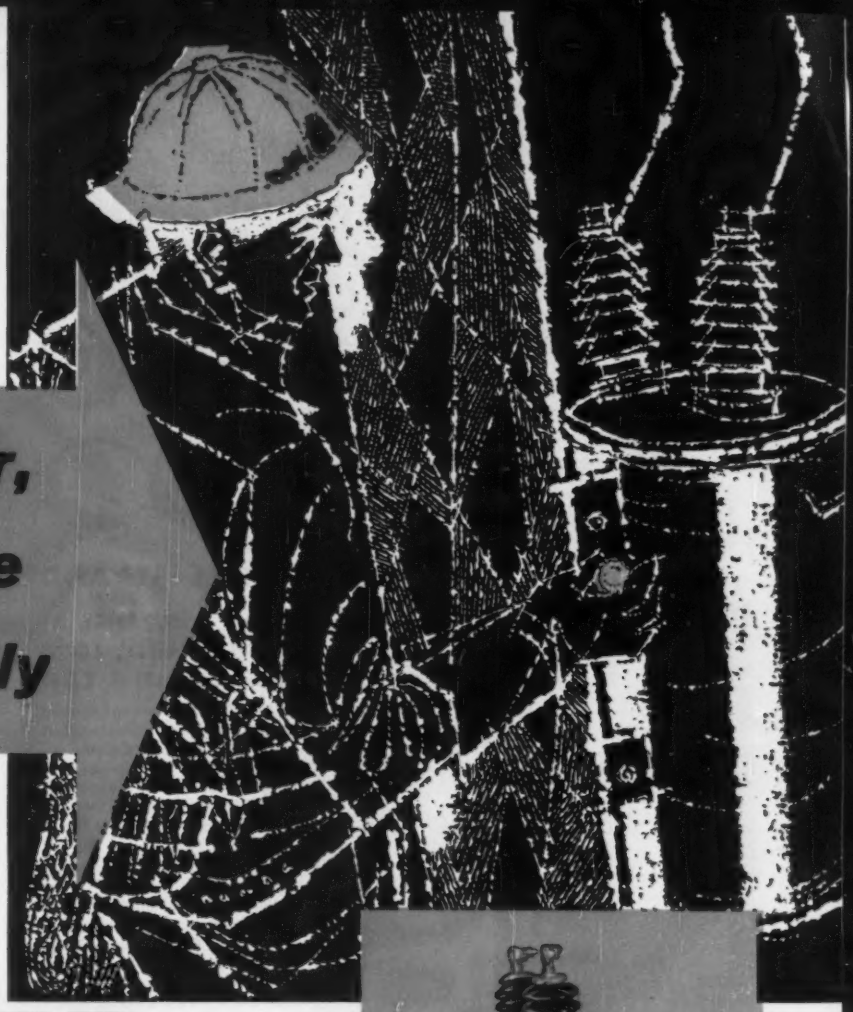
STEP 1
Remove screw-on type cap. Note husky, hand-size gripping area.

STEP 2
Reverse cap and use as handle. That's all there is to it!

Unique keying action between handle and slotted ring around shaft assures positive positioning of taps before handle can be removed.

The new RT & E tap changer body is molded in one piece, multi-skirted for long creepage and high surge strength. Material used is electrical grade, wood-flour filled phenolic of high thermal stability. Contact is made through a bridging roller, under spring pressure, especially grooved around the periphery to provide double contact surfaces. This assures low resistance and cool operation.

taps



Do it faster, safer, more economically

dependable operated CHANGER

- No handhole cover to remove!
- Reduces danger of tank breathing!
- No lengthy expensive, tap changing time!
- No confusion on tap setting!
- No danger of oil contamination!

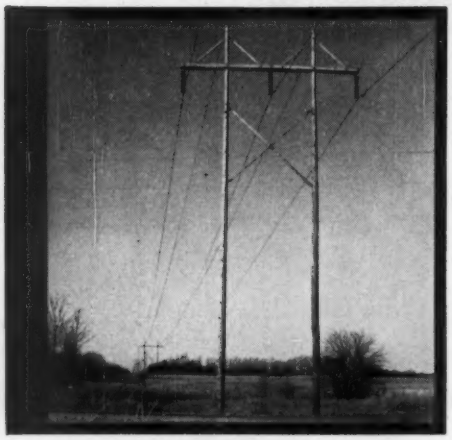
Ask your RT&E representative to demonstrate the RT&E Tap Changer or write for complete details to . . .

Engineering Talent
Concentrated on One Idea—
A Better Transformer!

RT&E CORPORATION

WAUKESHA, WISCONSIN • PORTLAND, OREGON

GALVANIZED STEEL STRAND

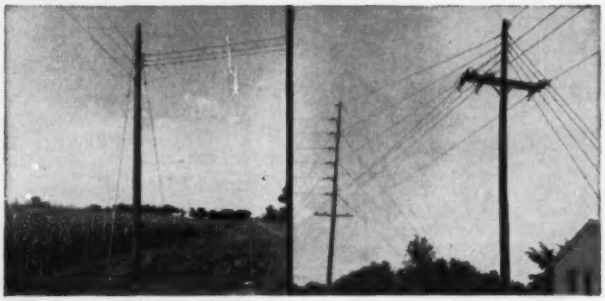


YOUR ASSURANCE OF HIGH QUALITY, LONG LIFE AND LOW COST

Close laboratory control over each step in manufacture has established Crapo Galvanized Steel Strand as a product of highest quality and dependability. You benefit through longer service life and lower ultimate costs.

Heavy, uniform, tightly-bonded coatings of commercially pure zinc, applied by the famous Crapo methods, withstand the punishment of construction, provide maximum resistance to corrosion and contribute to over-all economies.

For OVERHEAD GROUND WIRE . . .
CRAPO Weldless Galvanized Steel Strand



The most practical and economical strand for shielding transmission lines against lightning. Maximum strength and high fatigue endurance, inherent in Crapo Weldless Strand, provide that extra safety factor so important in overhead ground or static wire.

For GUYS and MESSENGER . . .
Crapo Galvanized Steel Strand. Made to highest standard specifications . . . a size and breaking strength to meet all practical needs.

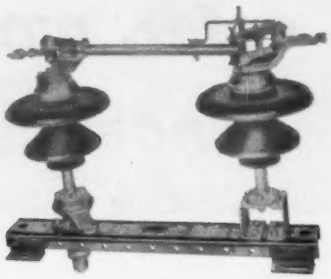
Contact your jobber or write for descriptive folder.

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

Insulation Test Set . . .

. . . for 5 to 150-kv range in capacities of ½ to 100 kva has low wave form distortion, trip-free breaker, and metering directly at high voltage output. Screwdriver adjustments permit simple recalibration of dual scale KV meter ranges. Units up to 2 kva are self-contained in portable cabinet. Larger units have tanked high voltage section in addition to control section.

Peschel Electronics, Inc, Towners, Patterson, N. Y.



Universal Mounting Base

. . . for power switches rated 7.5 through 69 kv is now standard feature. Movable clip angles provide wide range of mounting dimension adjustment and compensate for inaccuracies in mounting frame dimensions. Holes are equally spaced along each web of support channel. Switches ordered for one location can be easily adapted for another location by repositioning clip angles.

Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

Light Chain Hoist . . .

. . . raises half-ton loads at 50 fpm. Air-operated Model H-1000 has lowering rates up to 96 fpm under maximum load. Throttle control may be either manual nylon rope and pendant or remote control that permits one-hand operation through hand level, two lever throttle. Air operated unit is available with either roller or link chains and hook or trolley mounting.

Thor Power Tool Co, Prudential Plaza, Chicago 1, Ill.

(*More New Equipment on page* 116)

Are your "new" meters obsolete?

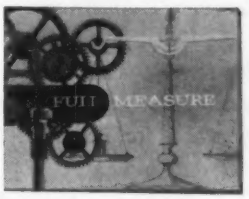
**Dick Blevins, Marketing Manager,
Meter Division,
Westinghouse Electric Corporation**

Sound like a ridiculous question? Let me explain.

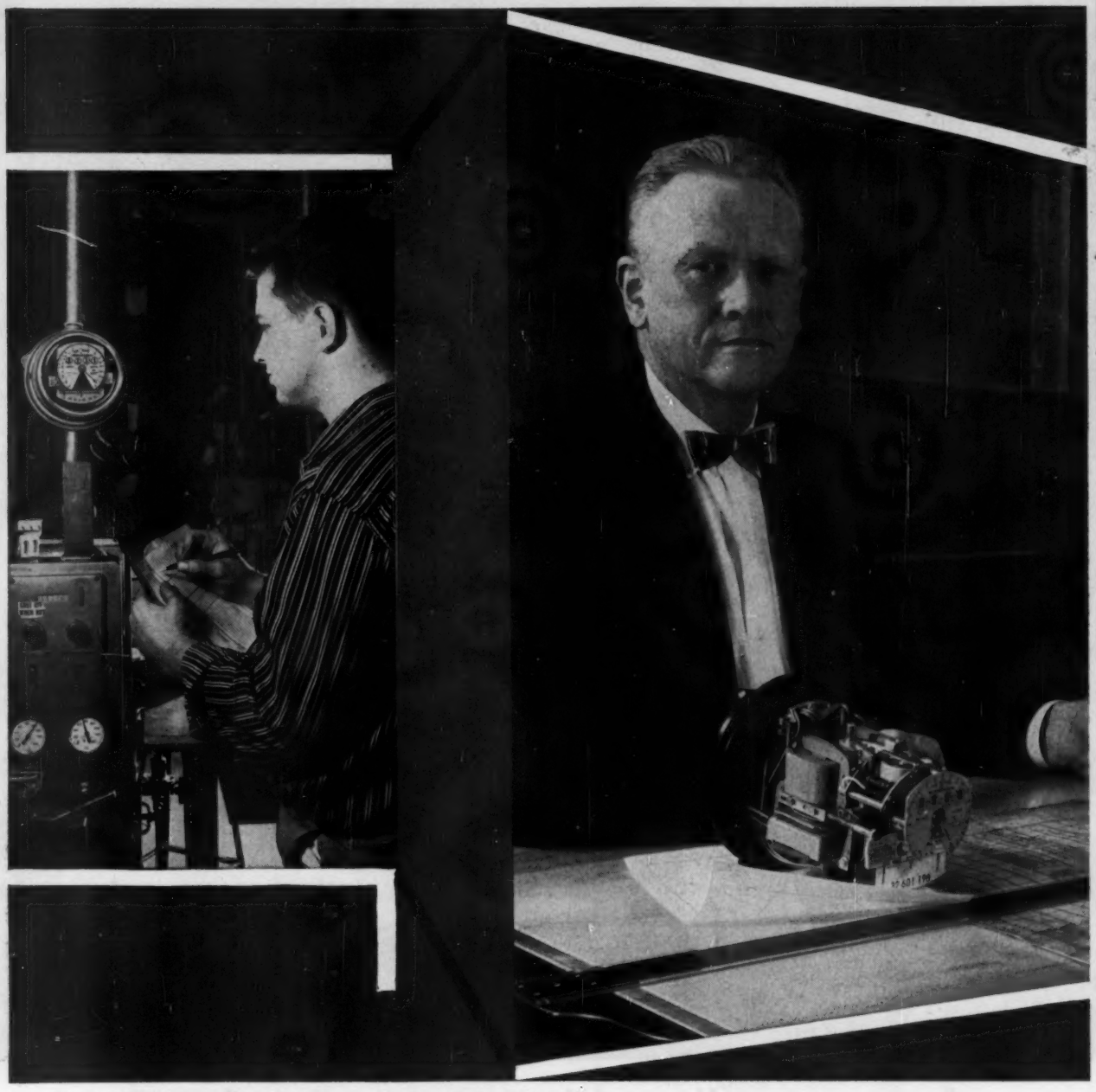
My question simply means: "Are the new Class 100 meters you recently purchased *already* overloaded by the growing housepower on your system?" *New* meters are no assurance of ample capacity.

The chart above indicates the way that residential loads outgrew the old 5-amp meters years ago . . . and how the trend is obsoleting the popular 15-amp meters now on some systems. With *average* loads passing 3,500 kilowatts a year, and growing rapidly, you need capacity not just to meter *today's* load . . . but reserve to accurately measure your service for years to come.

The Westinghouse policy of Plowing back Earnings into research brought you for the *first* time Class 200 watthour meters at the same price you'd been paying for the Class 100. Double the capacity at *no* increase in price. It's another contribution from the meter pioneer. Buy Westinghouse meters to assure *continued Full Measure* in product superiority and forward-looking reserach. J-40510



Has your Westinghouse representative shown you how to get Full Measure for **your** meter dollar? Ask him for a copy of this informative presentation, B-7280.



Typical application of polyphase accessories in an industrial plant.

A FULL line of Polyphase Accessories for all

From the Westinghouse policy of Plowback of Earnings into research comes a complete line of accessories for polyphase meters. T. D. Barnes, Manager of the Meter Engineering Department at Raleigh, N.C., points out the latest accessory addition . . . the CV impulse sender. This new device is a contactless, transistorized unit that obsoletes the conventional contacts for impulse metering. It eliminates forever the need for delicate adjustments and frequent maintenance. The extremely high impulse rate of this device pays its way in a short time on large installations where a single impulse skip can mean as much as a thousand dollars in lost revenue.

In addition to the new CV impulse sender, Westinghouse will continue to supply contact

FULL MEASURE
FROM
WESTINGHOUSE
METER
RESEARCH

your applications

devices of conventional design.

The RWD indicating demand register, shown here, features high accuracy and quick response. A cumulative demand register is available in the RWD-2 shown on the right.

Low-friction, quick-acting detents complete the line of accessories.

For full information about the economies of using Westinghouse polyphase meters on your system, call your Westinghouse sales engineer. Or, write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-40515

YOU CAN BE SURE...IF IT'S Westinghouse

wait a minute!

In photoelectric lighting controls, longer life and more reliability have been perennial concerns of both users and manufacturers alike for a number of years. Recently, however, there has emerged an unfortunately misleading generalization that tubes are THE big enemy, and once you get rid of them—presto—you automatically have a more reliable control.

Tubes give us the willies at times, too, but from what we've managed to learn after twelve years in this business, eliminating tubes is not an answer in itself, but only the approach. Very soon you realize that *to gain anything in the life and dependability of a control, you have to find something more reliable than tubes to put in their place.* Though not profound, this notion does not yet seem to be universally comprehended (e.g., gas tubes, motors, electrostatic relays, thermal relays and the like have not proved themselves in practice to be superior substitutes for vacuum tubes with established characteristics.)

In our efforts along this line aimed at improved over-all performance, about 1500 F-P controls of a new design have been on test now for a little more than a year and a half. They're small, have four components and no tubes, and look very promising. But until we're sure that they'll continue to do a better job than the Series 63300C and 64400, we think customers are better off with these F-P "old standbys". When the new 6600 *is* ready, we'll spread the word around. In the meantime, if you run into any other tubeless controls, it could be to your advantage to find out "what went in when the tubes went out." The Fisher-Pierce Co., 82 Pearl Street, So. Braintree 85, Mass.

FISHER PIERCE

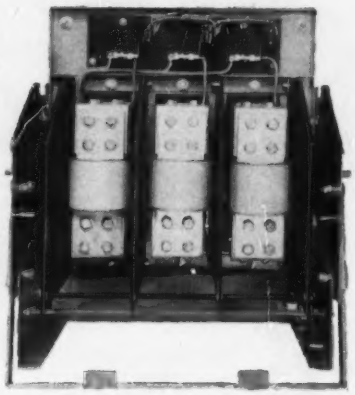
PHOTOELECTRIC LIGHTING CONTROLS

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

Capacitor Motors . . .

. . . for heavy duty use are offered in ratings of ¾ to 1.5 hp at 1,200 rpm; one hp to 3 hp at 1,800 rpm; and 1.5 to 5 hp at 3,600 rpm. These 1-phase, 60-cps, 115/230-v motors, designated Type WCZK, use dry electrolytic capacitor for high torque starting, and are switched to straight induction run as they gain speed.

Switch contacts can be easily reached and replaced without disturbing centrifugal actuating mechanism. Motors have dynamically balanced, copper-spun rotor.
Fairbanks, Morse, & Co, Chicago 5.



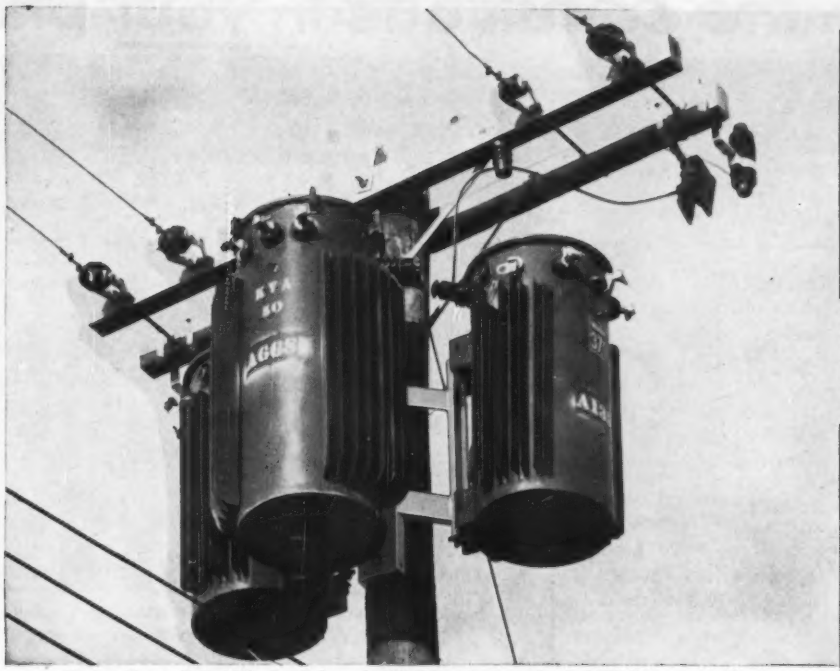
Fuse Carriage . . .

. . . accommodates fuses with 400 to 6,000-amp continuous load ratings. It can be used on main or remotely located circuit breakers. Features include positive lock drawout mechanism; operating mechanical and electrical interlocks; removable front for easy maintenance and replacement. Striker pin device prevents single phasing and reclosing on a fault. Bulletin 1020.
Penn Electrical Co, Box 151, Irwin, Pa.

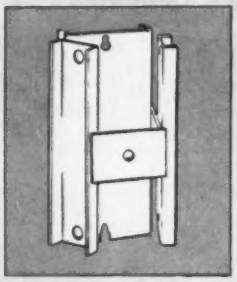
Tractor Backhoe . . .

. . . digs to depth of 12.5 ft at any point in 190-deg arc. Standard trench and undercutter bellhole-grave buckets are available in 18 to 36-in. widths. Exclusive ejector bucket, in 14-, 18-, and 24-in. witdths automatically forces all wet sticky material from bucket during dumping cycle. Equipment is de-

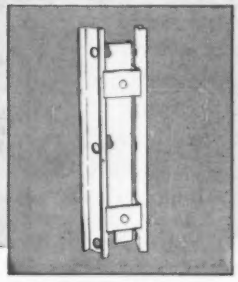
(*Continued on page* 120)



Cluster-Mount (305-100). For 5 through 100 KVA. Maximum load: 2,000 lbs. per transformer.



Dual-Mount (205-25). For 5 through 25 KVA. Maximum load: 1,000 lbs. per transformer. Ideal for increasing load capacity by mounting small transformers in parallel.



Dual-Mount (205-100). For 5 through 100 KVA. Maximum load: 2,000 lbs. per transformer. Connect two single-phase transformers, open delta for single and three phase loads, or mount one single-phase and one three-phase transformer.

Cluster Mount Your Transformers Quickly... Easily... Securely with *TECO thru-bolt Mounting Brackets*

Cluster mounting two or more transformers is no problem with TECO thru-bolt cluster mounting brackets.

Transformers can be bolted to brackets with majority of connections made on ground and then hoisted into place... all in half the time required to install a band-type cluster rack.

When you consider cluster transformer mounting brackets, remember that TECO offers you..

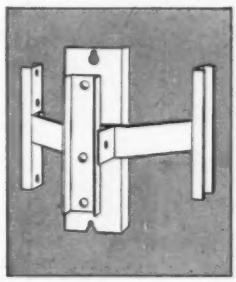
Safer, more secure installation with thru-bolt mountings. Brakets are of hot galvanized, one-piece welded construction. Key hole and slots provide ease of installation. All TECO brackets have a two to one safety factor.

No parts to lose... no complicated assembly.

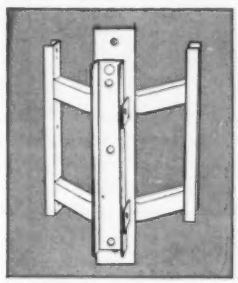
Safety for linemen. Plastic cap over head of bolt eliminates possibility of ground contact.

Easier storage. TECO cluster mounting brackets can be stacked on top of each other... require only a minimum of storage space.

For more information about TECO thru-bolt brackets... your best answer for cluster transformer mounting..write today to:



Cluster-Mount (305-25). For 5 through 25 KVA. Maximum load: 1,000 lbs. per transformer.



Cluster Heavy-Duty Mount (350-167). For 50 through 250 KVA. Maximum load: 3,000 lbs. per transformer.

TURNER ELECTRIC CORPORATION

9510 St. Clair Avenue • E. St. Louis, Illinois

Complete line of air-break switches, flexi-band and thru-bolt cluster transformer brackets, dead-end band brackets.

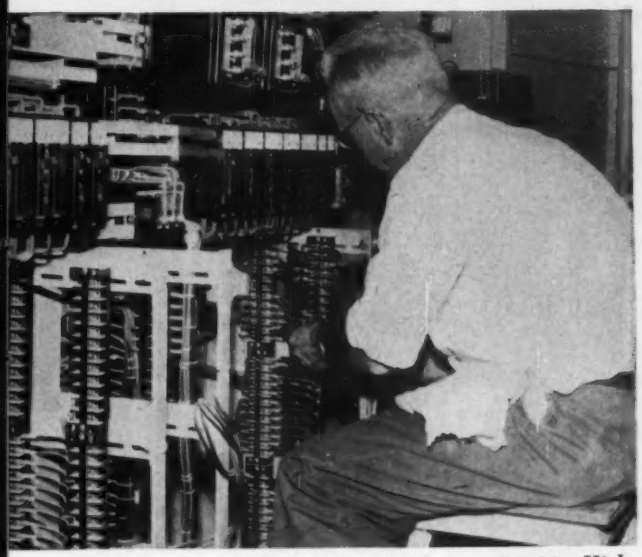
Match the conditions in your plant

TYPE AND VOLTAGE RATING	CHARACTERISTICS	GENERAL APPLICATIONS	INSTALLATION METHODS
RUBBER—Insulated Control Cables			
Rubber-Insulated 600-Volts	The standard Anaconda rubber control cable—with excellent moisture resistance, heat stability and long-aging characteristics.	General-purpose and station control requirements of utilities and industrials.	Can be installed aerially, in conduit, underground in ducts – or buried directly in the earth.
Ozone-Resistant Rubber-Insulated 600-Volts	An ozone-resistant control cable also possessing proved moisture resistance, heat stability and long-aging characteristics.		
THERMOPLASTIC—Insulated Control Cables			
Polyethylene-Insulated 600-Volts	A standard Anaconda thermoplastic control cable with excellent moisture and chemical resistance. Highly resistant to electro-endosmosis. A long-lived cable.	General-purpose control requirements of utilities and industrials.	Can be installed aerially, in conduits, underground in ducts—or buried directly in the earth.
DENSHEATH® Insulated 600-Volts	A standard Anaconda thermoplastic control cable with excellent moisture and chemical resistance. Long-aging performance.		
Anaconda Type PND* Polyethylene-Insulated – Nylon Conductor Cover 600-Volts**	An approved control cable with dependable chemical and abrasion resistance. Features small diameter. Long-aging properties.	General-purpose control requirements of utilities and industrials where space is a limiting factor.	Can be installed aerially, in conduit or underground in ducts.
Polyethylene-Insulated 1000-Volts	A thermoplastic control cable excelling in moisture and chemical resistance. Features heavy insulation thickness. Long-aging characteristics.	Station control requirements of utilities and industrials.	Can be installed aerially, in conduit, underground in ducts – or buried directly in the earth.

**IPCEA voltage rating is 300 volts.
*Trademark

Lead sheaths are furnished on rubber-insulated control cables if requested.
Interlocked armor is available for all types of control cable.

with these Anaconda Control Cables



Anaconda's Type ANW-Rubber-Insulated Control Cable. High-quality product offering peak reliability, outstanding heat resistance. Cable is also highly resistant to moisture, acids, alkalies, other chemicals. Unusual overload capacity and long-aging characteristics. Individual conductor covering and over-all jacket of neoprene.

Anaconda Thermoplastic Control Cable Multiple-use. Can be installed aerially, in conduit, underground in ducts, or buried directly in earth. Available with polyethylene (600 or 1000 volts) or Densheath* vinyl resin (600 volts) insulation and Densheath over-all jacket. Densheath jackets over polyethylene-insulated conductors on request.

Butyl-Insulated Control Cable. Special ozone-resistant control cable. Individual conductor covering and over-all jacket of neoprene provide maximum insurance against moisture and mechanical injury.

Anaconda Type PND Control Cable. For general-purpose uses where space is a limiting factor. Allows installation of a 12-conductor cable in conduit carrying a 6 or 7. Individual conductor covering of abrasion-, oil- and gasoline-resistant nylon.

Permanent Full-Color Coding on rubber cables, by means of Anaconda's rubber-base coating, assures quick and positive circuit identification. Coding by surface printing, which conforms to IPCEA standards, also available. On thermoplastic cables, full-color coding with pigmented insulation and surface printed coding are likewise offered.

For full information on any of Anaconda's complete line of control cables – including cables engineered for more specialized control requirements – see the Man from Anaconda. A comprehensive technical booklet on Anaconda Control Cables is yours for the asking. Write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

*Reg. U.S. Pat. Off. 5833 Rev.

LIVE BETTER ELECTRICALLY

SEE THE MAN FROM **ANACONDA®**
FOR **CONTROL CABLE**

AMERICA'S *COMPLETELY* DECAY-IMMUNE POWER LINE POLE

● *Once installed, Life-Span Western Red Cedar Poles will furnish many MORE years of trouble-free service at far less per annum maintenance costs.*

Life Span

This trade mark on a pole is truly a symbol of quality! Life-Span, butt-to-tip clean poles, are the result of years of continuous research coupled with the entire productive energies of one company —concentrated on the single objective of developing poles that are completely immune to decay. If you are concerned about pole-line maintenance costs, Page & Hill can help you.

PAGE & HILL, Inc.
Minneapolis 3, Minnesota

LIFE-SPAN Western Red Cedar Poles or Treatment to comply with all approved E.E.I. or A.W.P.A. non-pressure specifications.

NOW ... Page & Hill maintains three mechanized yards and treating plants with modern handling equipment to supply you promptly and efficiently.

Tractor Backhoe

(*Continued from page* 116)

signed for low maintenance. Model U Front loader is also available.
Ottawa Steel Div, Young Wire & Spring Corp, Ottawa, Kansas

Portable Transceiver . . .

. . . has fully transistorized receiver. Lightweight unit has 0.4 mv sensitivity, can be used indoors or out. Industrial-type batteries are standard equipment. Modular design and plug-in components simplify servicing. It is designed for operation on two frequencies.
General Electric Co, Communications Products Dept, Syracuse, N. Y.

Submersible AC Motors . . .

. . . for direct coupling to pumps which must operate continuously in oil, water or liquid chemicals, are offered in ratings of ¾ to 15 hp. These polyphase single voltage motors are rated 55 C rise for 30-min duty in 40-deg C air and for continuous duty in 40-deg C liquid.
Reliance Electric & Engineering Co, 24701 Euclid Ave., Cleveland 17.

Correction

Insulation stripping tool is designed for control cable, bus drops, flexible cords and telephone cable with vinyl or polyethylene jackets. Manufacturer is Mathias Klein & Sons, 7200 McCormick Road, Chicago 45, Ill., rather than The Buchen Co, Chicago. The latter, Mathias Klein's advertising agency, was inadvertently mentioned as the producer in EW, April 28, p 114.

new symmetrical interrupting ratings for XS Cutouts adjust lab results to field conditions

S&C matches actual ratings to system short-circuit calculations—

To simplify application, S&C has now provided symmetrical ratings for its distribution cutouts.

These new symmetrical ratings are provided because asymmetrical ratings are based on total available short-circuit current of the circuit, including the DC component. The asymmetrical ratings furnish a uniform, standardized measure of cutout performance, but they cannot, of course, be used directly in matching cutouts to system short-circuit calculations which yield *symmetrical* values.

The new symmetrical ratings bridge the gap and eliminate the possibility of "underprotecting" the system with a cutout of inadequate interrupting capacity, or "overprotecting" with a cutout of unnecessarily high interrupting capacity.

To arrive at a nominal set of symmetrical ratings, specific X/R ratios are assumed for the Heavy Duty XS and the Extra Heavy Duty XS,—8 and 12 respectively—typical of the conditions at locations where each of these cutouts is applied (see table at right).

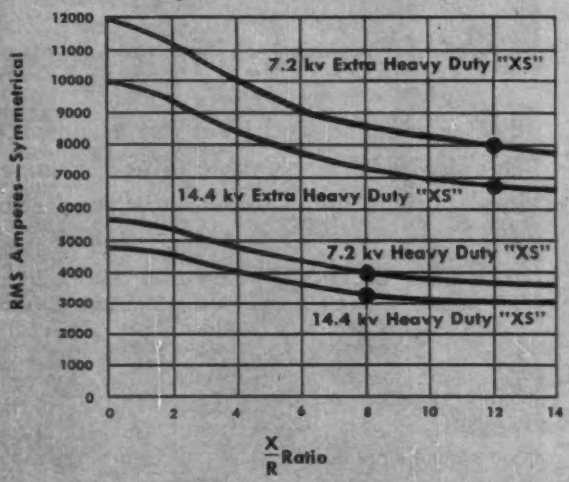
To enable the distribution engineer to take advantage of more favorable conditions—that is, where the X/R may be lower—special adjustment curves (shown to the right) are provided. These curves indicate the symmetrical interrupting ratings of the XS at other X/R ratios. (Those at 0 are the *actual* asymmetrical interrupting capacities of the XS, which may differ from the *nominal* asymmetrical ratings per NEMA standards.)

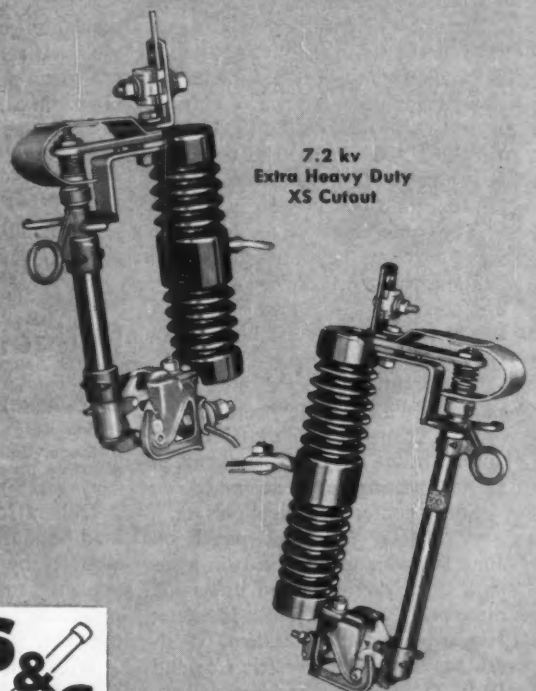
For further information, write for Descriptive Bulletin 511—providing full data on the XS Cutout—to S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.

50/60 Cycle Short-Circuit "Nominal" Interrupting Ratings

Nominal Ratings kv	Amperes, RMS			
	Heavy Duty "XS"		Extra Heavy Duty "XS"	
	Asymmetrical	Symmetrical	Asymmetrical	Symmetrical
7.2	5000	4000	12000	8000
14.4	4000	3300	10000	6700

Adjustment Curves for Symmetrical Interrupting Ratings of XS Cutouts at various X/R Ratios.





7.2 kv Extra Heavy Duty XS Cutout

14.4 kv Heavy Duty XS Cutout

S&C ELECTRIC COMPANY

Power Fuses · Tool-Operated Disconnects · Open and Enclosed Cutouts · Load Interrupters · Metalclad Switchgear · "Loadbuster"

BROOKS CADWELL BECK WALLACE FLEMING VENNARD

EW Electric Heat Meeting Slated for June 5-6

Electric Heating and Heat Pump confab, co-sponsored by Electrical World, NEMA and heat pump makers, will peg load growth, utility experiences, and equipment advances

Electrical World is planning to hold its Third Electric Space Heating and Pump Conference on Thursday and Friday, June 5-6, in New York City. The conference, which will be co-sponsored by the Electric House Heating Equipment Section of National Electrical Manufacturers Association and selected heat pump manufacturers, is to be held at the Barbizon-Plaza Hotel.

In a letter to utility presidents announcing the conference, Electrical World Publisher and Editor Fischer Black called electric heating and heat pumps, "the greatest load builders the industry has seen in years."

The conference's three objectives:

- To gauge the status of electric heating, resistance and heat pumps, and to relate it to the prospects of the shift-to-summer peaking situation in various regions.
- To outline selected utility experience with electric heating.
- To help bring the industry abreast of the latest developments in electric heating and heat pumps.

Some conference highlights . . .

A Special luncheon panel on June 5th with speakers Edwin Vennard, vice president and managing director, Edison Electric Institute; Howard Cadwell, president, Western Massachusetts Electric Co; and Paul D. Brooks, vice president, American Electric Power Co (formerly AG&E).

"A Utilityman's Class in Electric School Heating", a joint presentation by Paul Emler, assistant vp, American Electric, and Dr. Hugo Beck, superintendent of the School District of Bayless in St. Louis. Emler will tell the story of AEP's growing school heating load. Beck will point out the current factors in education economics which favor electric heat, and how they affected the decision to build an electric school in St. Louis.

A factual comparison of heat pumps and resistance heating by Georgia Power's C. W. ("Cy") Wallace, Jr.

A manufacturers panel on resistance heating covering the residential, commercial and industrial markets.

A heat pump manufacturers panel on the same subjects, plus a treatment of the growing importance to utilities of the room or zonal heat pump.

A second-day luncheon speech on "centripital force" aspects of electric heating by Wiegand's Vice President Bruce Fleming.

A builder's view of electric heating, showing how one Fort Wayne, Indiana builder is using it to cut costs and hence, home prices.

An outline of support from other quarters, including the electric heating and heat pump activities of Live Better Electrically's Gold Medallion Homes program; the activities of various industry associations; and the new consciousness of electric heating for coal markets by the coal mine operators and United Mine Workers.

Budget Control Focuses Sales Spending

OTTO A. HIRR, Administrative Assistant, San Diego Gas & Electric Co, San Diego, Calif.

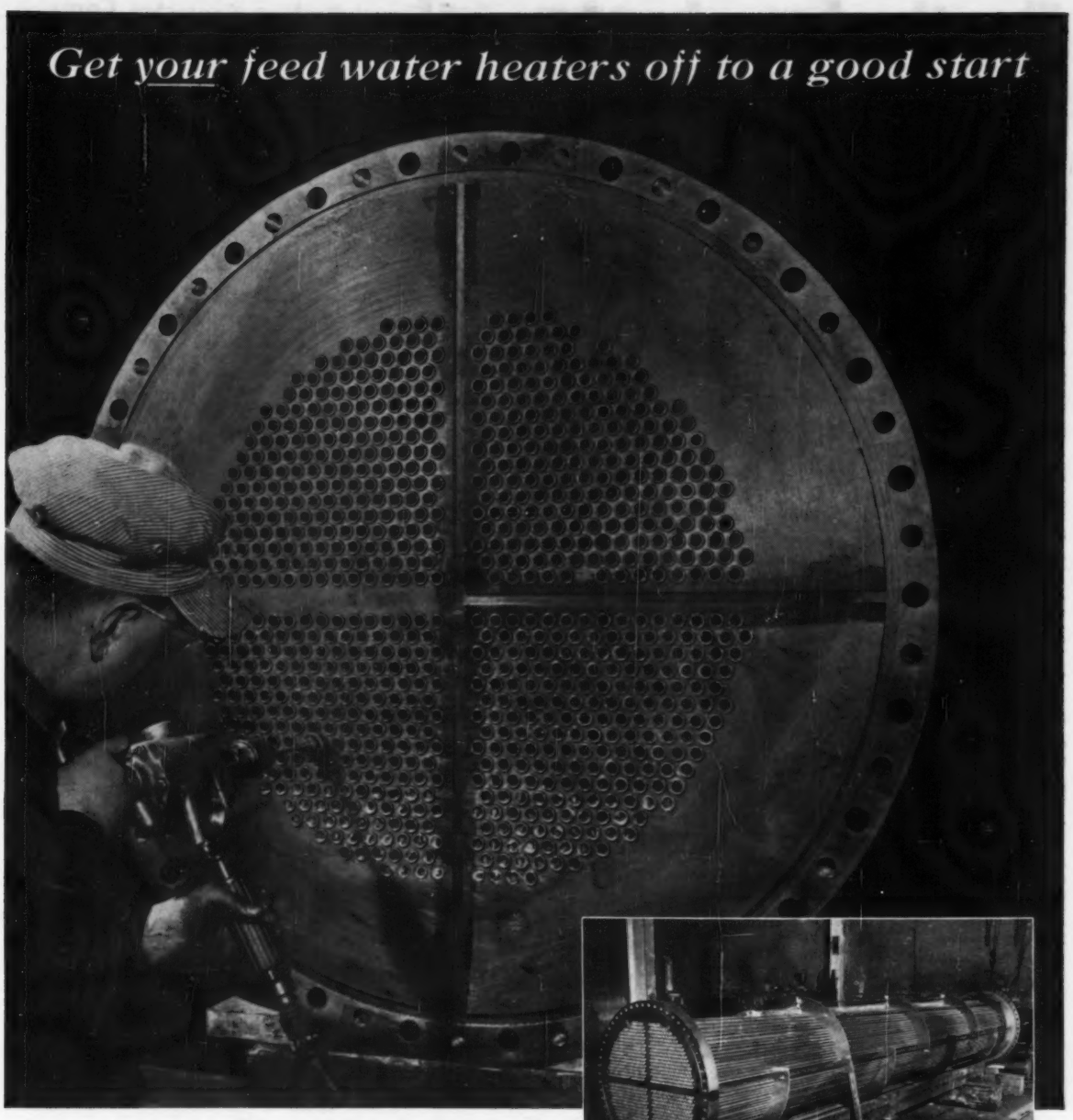
Dollars for sales promotion and load building can be spent more effectively by distributing the annual approved expenditures of these items uniformly and consistently during the year.

With this concept in mind, San Diego Gas & Electric Co has set up budgeting and reporting procedures which provide accurate control of expenditures by sales department heads.

The procedure is based on a "prospectus" for individual promotions or campaigns and a running tabulation of expenditures by months. By relating individual activities to the overall sales plan, the system works to eliminate "overspending" in any particular activity or period. It also alerts sales division management to any comparative slowing down of sales effort on

(*Continued on page* 124)

Get your feed water heaters off to a good start

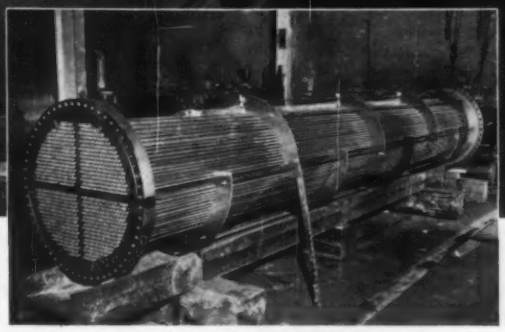


. . . tube with REVERE

Since no single alloy will be most reliable and economical under all various conditions encountered, the wealth of knowledge accumulated through Revere's Research Department is of vital importance to you.

For, over the years these specialists have compiled extensive data regarding the relative corrosion resistance of the different alloys under a wide variety of operating conditions. Why not take advantage of this storehouse of facts and consult with Revere's Technical Advisory Service before selecting the tubes for your equipment?

Revere also furnishes plates, from the smallest to the largest sizes, in Cupro-Nickel, Copper, Herculoy, Muntz Metal, Naval Brass and Admiralty, and tubes in Cupro-Nickel, Aluminum Brass, Admiralty, Herculoy, Arsenical Copper, Muntz Metal and other alloys.



REVERE 70/30 and 80/20 CUPRO-NICKEL tubes were used in high and low pressure feed water heaters designed and fabricated by CONDENSER SERVICE & ENGINEERING CORP., Hoboken, N. J., for Kent Avenue Station of the New York City Transit Authority.

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

Mills: Rome, N. Y.; Baltimore, Md.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Brooklyn, N. Y.; Newport, Ark.; Ft. Calhoun, Neb. Sales Offices in Principal Cities, Distributors Everywhere.

For the long haul

guy with

CF&I GALVANIZED STEEL STRAND

Stringing lines over woodlands or difficult terrain is an expensive initial operation. But maintainance, too, can be costly unless the guy and messenger wires have the strength to withstand severe storms and the corrosion-resistance to assure long, trouble-free service.

To meet these requirements, CF&I carefully controls every step in drawing, galvanizing and stranding its Galvanized Steel Strand. Extreme care in cleaning and galvanizing produces a heavy, tightly-bonded coating of pure zinc that provides maximum protection against corrosion. CF&I Strand meets or exceeds ASTM Specifications A-122 or A-363, or can be made to meet customer specifications in seven- and three-wire constructions.

Your nearest Electrical Wholesaler or CF&I representative will give you full details. Call him today.

CF&I GALVANIZED STEEL STRAND
THE COLORADO FUEL AND IRON CORPORATION

5800

Albuquerque • Amarillo • Atlanta • Billings • Boise • Boston • Buffalo • Butte • Chicago • Denver • Detroit • El Paso
Ft. Worth • Houston • Kansas City • Lincoln (Neb.) • Los Angeles • New Orleans • New York • Oakland • Oklahoma City
Philadelphia • Phoenix • Portland • Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Wichita

Budget Control

(*Continued from page* 122)

a monthly or quarterly basis. Finally, the procedure includes an evaluation of individual campaigns.

The prospectus is used by the various department heads to request money for all types of campaigns or promotions.

After a promotional campaign has been planned, the department head prepares a prospectus written in the form of a letter or memorandum. It requests an appropriation to cover all expected campaign costs such as purchased materials, advertising supplies, space, production costs, and TV and radio time.

The prospectus first is forwarded to an administrative assistant in the Commercial Division. He determines whether the proposed campaign is within the authorized budget for the particular department and promotion. If it meets these requirements, it is so stamped. This

Serial No. 56-88	(initial)	(date)
Budget Approval	Him	12-5
Sales Mgr. "	Emm	12-5
Advertising "	FAR	12-5
Executive "	RCP	12-6
Budget Allowance $	15,000.00	
CONTROL		
Promotion Estimate	$ 14,600.00	
Actual Expenditure	$ 14,441.00	
Difference	$ 159.00	

stamp (see illustration) provides spaces for the appropriate signatures and for budget allowance and the estimated expenditure. Then the prospectus is forwarded, as indicated on the stamp to the sales manager, advertising manager, and sales vice president for approvals. If fully approved, it is carried out.

When the campaign is over, the originating department head is required to submit a final report. This report must contain an evaluation of the results of the campaign, its estimated cost compared to actual cost, and suggestions for improving any subsequent promotion.

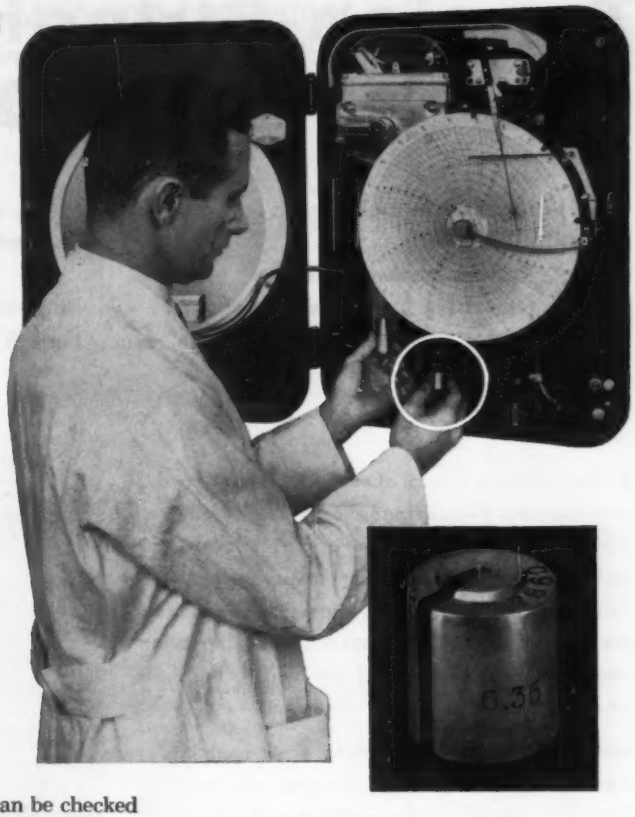
To provide control over current and cumulative sales expenses, the administrative assistant submits reports every month on all departments in the Sales Division.

(*More Selling on page* 128)

HAGAN RING BALANCE FEATURES—NO. 3

CHECK CALIBRATION OR CHANGE RANGE IN MINUTES

without water columns—without disconnecting meter from line



TIME SAVER—This shows how easily a Ring Balance can be checked. Note there are no two-story water columns—one man is doing the job—and the meter has not been disconnected from the line. In fact, Ring Balance can be checked at full static pressure if desirable.

The check weight is factory calibrated against a micrometer type manometer, and its equivalent in inches of water column is stamped on the side. The serial number of the meter to which it belongs is also stamped on the collar. A full set of calibrated weights is supplied with each meter.

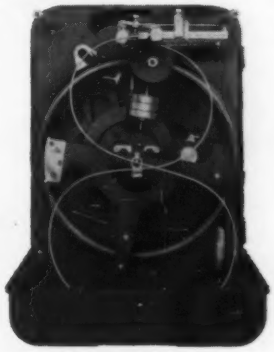
The calibration of any Hagan Ring Balance meter can be checked —in minutes—by simply hanging the appropriate weight on the check weight rod. Similarly, range change over a seven to one differential range can be done with equal speed and accuracy.

In terms of instrument technician's time, you can easily figure how much this one feature of the Ring Balance will save you. And, you don't have to take a busy pipefitter away from other work to break connections.

Ask your Hagan engineer to show you how easily range change and calibration checks can be made, using only the set of check weights supplied with each meter. Ask him, too, to explain some of these other outstanding features of the Hagan Ring Balance:

1. High sensitivity at low flows due to unique range calibration system. Full scale deflection at ½" WC.
2. Safe operation with rings rated at 2,500, 6,000, 15,000 psig. No gaskets, no stuffing boxes.
3. Sealing fluid density and level not critical. No eye-droppers.
4. Interchangeable ring assemblies for full scale ranges from 0.5" WC to 560" WC. Adjustment on any one ring over a seven to one differential range.
5. Wide range computation and/or compensation by means of built-in, easily checked mechanisms available on most models.
6. Pneumatic or electric transmission also available.

Bulletin MSP-141 describes these features and the new design of the Hagan Ring Balance meter case. ASK US FOR IT.



Rear view of Ring Balance with cover plates removed. Here the test weights are in position on the test weight rod. Note accessibility of all parts for easy adjustment.

HAGAN CHEMICALS & CONTROLS, INC.

HAGAN BUILDING, PITTSBURGH 30, PENNSYLVANIA
DIVISIONS: CALGON COMPANY, HALL LABORATORIES
IN CANADA: HAGAN CORPORATION (CANADA) LIMITED, TORONTO

Tension-Stringing with PENGO Equipment

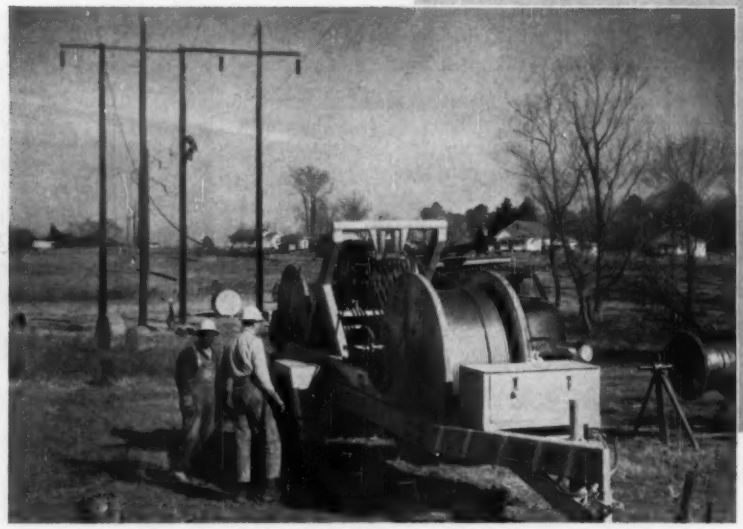
- ***Saves costly manhours in lagging.***
- ***Reduces number of set-ups (can string 2 or 3 reels per phase from a single set-up).***
- ***Safest, most economical way of stringing transmission, distribution and even secondary lines.***
- ***Its greatest savings are effected when stringing over and through energized circuits . . . by far the safest, too!***

Smooth, positive control of conductor tension can be maintained at all times regardless of model or size of PENGO tensioning equipment used. The large, specially designed PENGO disc brakes are mounted away from the Bullwheels to assure dissipation of the heat generated by the continuous braking action and prevent transmission of the heat to the Bullwheels.

PENGO pulling and tensioning equipment is designed and built by an organization with years of actual line construction experience and a thorough knowledge of stringing problems and requirements. PENGO Tension-Stringing equipment has been thoroughly proven in world-wide use, under the widest range of conditions.

PENGO offers more than 40 models of Tension-Stringing equipment to meet any requirement as to conductor sizes, terrain, and stringing conditions.

PULLING IN new 666,000 CM ACSR on an Arkansas Power & Light Co. reconductoring job on 115 KV H-frame line near Pine Bluff with a PENGO Model 6500 BWCP. Old 4/0 ACSR conductor was used as pulling line; PENGO puller's thick Neoprene-lined Bullwheel grooves prevented injury to old conductor, which was wound on reels for re-use.



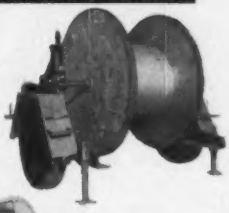
PENGO 6000 WSTR Tensioner (foreground) paid out new conductor under controlled tension at other end of stringing operation; conductor was kept in the air during the entire stringing operation.

PENGO Job-Proved Tension-Stringing Equipment

Manufactured by the makers of the World Famous PENGO Earth Auger

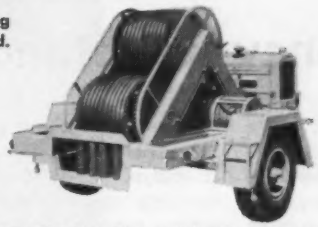
NOTE: More than 40 models of PENGO Tension-Stringing equipment models are available for every stringing need.

PENGO Bullwheel Cable Pullers



MODEL 6100 TC-RW Reel Winder.

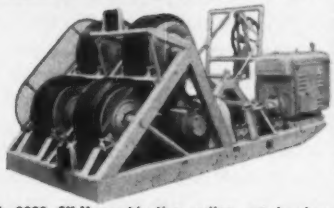
MODEL 6700-I, trailer mounted, pulls one conductor or pulling line. Tensions to 12,000 lbs. Use with PENGO 6100 TC-RW Reel Winder.



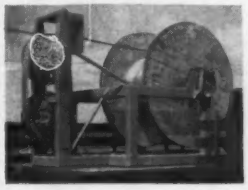
MODEL 5700-II, trailer mounted, pulls one or two conductors or pulling lines. Tensions to 4,000 lbs. Use with PENGO 6100 TC-RW Reel Winder.

MODEL 6700-II, skid mounted, pulls one or two conductors or pulling lines. Tensions to 12,000 lbs. Use with the 6100 TC-RW Reel Winder.

PENGO Tensioners



MODEL 6000 SK-II combination puller and tensioner. Handles one or two conductors to 1,272,000 CM.



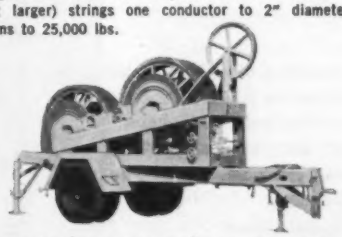
MODEL 5000 S-I strings one conductor to 556,000 CM. Tensions to 2000 lbs., takes reels to 44" x 72".

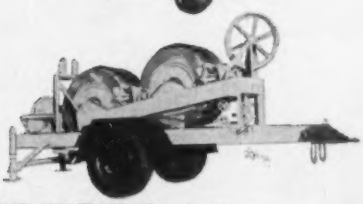
MODEL 5000 TR-II strings one or two conductors to 556,300 CM. Tensions to 1500 lbs. per conductor. Designed for very rough country work as well as general use; use with separate reel-carrying dolly or PENGO 6100 CT-RW.

MODEL 6000 WS-TR strings one or two conductors to 1,272,000 CM. Tensions to 5000 lbs. per conductor. Complete trailer unit with reel-carrying devices, for general and medium-rough country use.

MODEL 6000 XHD-TR-I shown with snubbing brake. Strings one conductor to 1,272,000 CM. Tensions to 10,000 lbs.

(Below) **MODEL 7000 TR-I-72** (similar to 6000 XHD-TR-I, except larger) strings one conductor to 2" diameter. Tensions to 25,000 lbs.





MODEL 7000 TR-I-54 strings one conductor to 2" diameter. Tensions to 25,000 lbs. Extra sturdy, with 54" Bullwheels for low center of gravity – ideal for mountainous terrain.

List your requirements and send for descriptive literature and prices.

PETERSEN ENGINEERING CO., INC.
Santa Clara, California

B-2

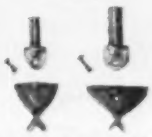
Other PENGO Products

Heavy Duty Double Helix Augers

Extra Heavy Duty Flight Augers (shown with gravel guards)

Offset Boring Heads

Heavy Duty Offset Boring Heads



Screw Bits for Small Holes

Pulling Eye

Screw Anchor Tool

Pole and Transformer chariot

PETERSEN ENGINEERING CO., INC.
Santa Clara, Calif. Dept. G5
Please send PENGO Tension-Stringing equipment data to:

NAME:_____

FIRM:_____

ADDRESS:_____

CITY_____ STATE_____

High Frequency Resistance Welder Saves 23%

A 23% saving in material costs, a big reduction in inventory requirements, and a smoother operation—these are the results of a new, high frequency resistance welding head used to weld aluminum tubing at the JFD Manufacturing Co in Brooklyn, N. Y. Now, instead of stocking many different sizes of tubing, used in fabricating antennas, furniture, and clothes driers, JFD buys 24-inch wide aluminum sheet, in rolls of 2,000 to 3,000 ft and fabricates its own tubing in the size and quantity needed. Because any size tubing needed can be produced on short notice, the operation is more flexible and there are no delays in delivery or production. Tubing of any diameter can be produced at rates up to 290 ft per minute, depending on the wall thickness.

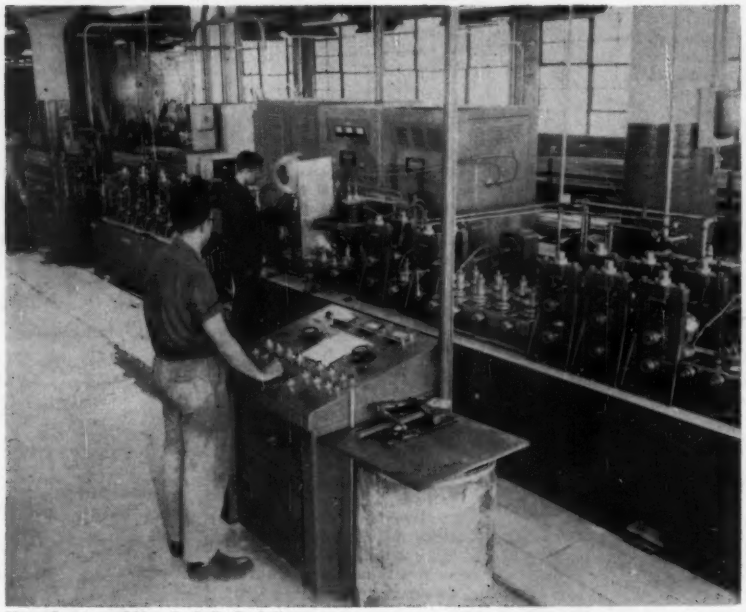


Photo Courtesy of New Rochelle Tool Corp

The 24-inch sheet is cut into strips of the proper width, put through a conventional tube mill, and fed into the welding head. Utilizing a phenomenon known as the proximity effect, the 50-kw, 250-kc resistance welder concentrates all the heat in the two interfaces to be joined. No heat is wasted on the rest of the surface and tubing of any size can be handled. Moreover, the metallurgical changes in the metal near the weld are minimized and the amount of flash is reduced.

After welding, the tubing is scarfed and burnished. The weld is then almost undetectable. At the present time, three men handle the entire operation.

Good Lighting Converts Storeroom To Production Space

ELMER SWITZER, Chief Electrician, Shuron Optical Co, Geneva, N. Y.

Better quality lighting for close visual tasks has improved production and resulted in higher quality work with less rejects at the Shuron Optical Co, Geneva, N. Y. Improved housekeeping and increased employee comfort and efficiency have also been effected. The new lighting was used in converting a 62x79-ft storeroom to provide increased production space for lens grinding and polishing.

Fifty-four, 2-light fixtures with 8-ft slimline, C. W. lamps were installed, using 6 rows, with 9 fixtures per row, on 10-ft centers. The fixtures were mounted 10 ft above the floor to provide 50-ft-c of well-distributed light on the working surfaces. The walls and ceilings of the room were painted white, except for the wall portion within 4 ft of the floor which was painted a medium green. For inspection purposes, supplemental lighting, consisting of a 60-w tungsten-filament lamp,

was added to each machine. This type of lamp is ideal because a lamp filament casts an image on the lens as it is rotated, making detection of defects easier.

Thermalastic insulation sets reliability record

ANOTHER PRODUCT OF EARNINGS PLOWED BACK

Faced with sharply rising operating costs, electric utilities know they can't rest on a plateau of efficiency. To continue bettering their performance, they demand more capacity, more reliability in new generating equipment . . . advances that come only through intensive research efforts.

By plowing back earnings into a program of pure and applied research, Westinghouse has developed many such advances, as typified by Thermalastic® insulation. The record: *Since 1949, Thermalastic insulation has assured the trouble-free operation of more than one-half million coils in electrical apparatus such as generators and large motors.*

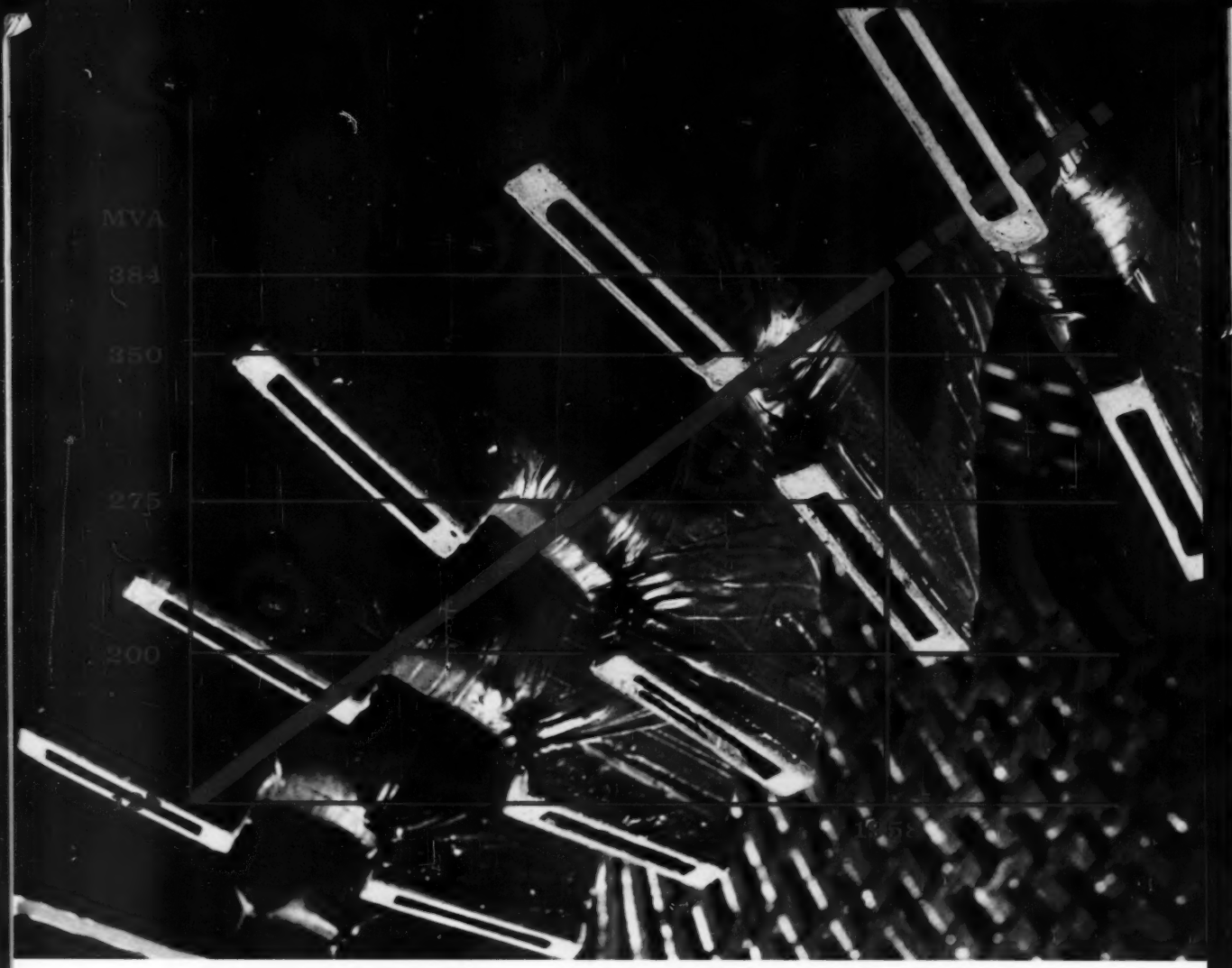
More than 6,000 scientists, engineers and technicians in Westinghouse research and development laboratories are at work developing and perfecting new techniques, materials and products such as Thermalastic insulation. This reinvestment in research is helping utilities produce more electricity at less cost.

For a new booklet describing the Thermalastic insulation system, write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

Voltage tests prove that Thermalastic insulation has a 1000-to-1 advantage. Operating voltages can't get through the fish-scale barrier of large mica splittings . . . locked in a memory-type elastic bond.

YOU CAN BE SURE... IF IT'S

Westinghouse



THROUGH PLOWBACK OF EARNINGS INTO RESEARCH . . .

Westinghouse hydrogen inner-cooled generators set world's capacity record

A 384,000-kva hydrogen inner-cooled generator, now under construction at Westinghouse, will soon break the world's capacity record. The largest capacity generators *operating* today are two 319,445-kva rated units, also Westinghouse hydrogen inner-cooled.

Westinghouse succeeded in developing and introducing hydrogen inner-cooling of both stator and rotor windings of large turbine generators after plowing back millions of dollars into research and engineering.

This method of cooling generators has made possible the large ratings that are common . . . and necessary . . . today.

When even larger ratings are needed, Westinghouse will provide them with the same hydrogen inner-cooled system, proved reliable by more than 3,200,000 kva already in service.

Hydrogen inner-cooling is a typical result of Westinghouse research . . . research that provides electric utilities with *advanced* generating equipment. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

JI-97229-2

YOU CAN BE SURE...IF IT'S Westinghouse

Report on
Electrical Business Outlook

I. An Upturn in Homebuilding?

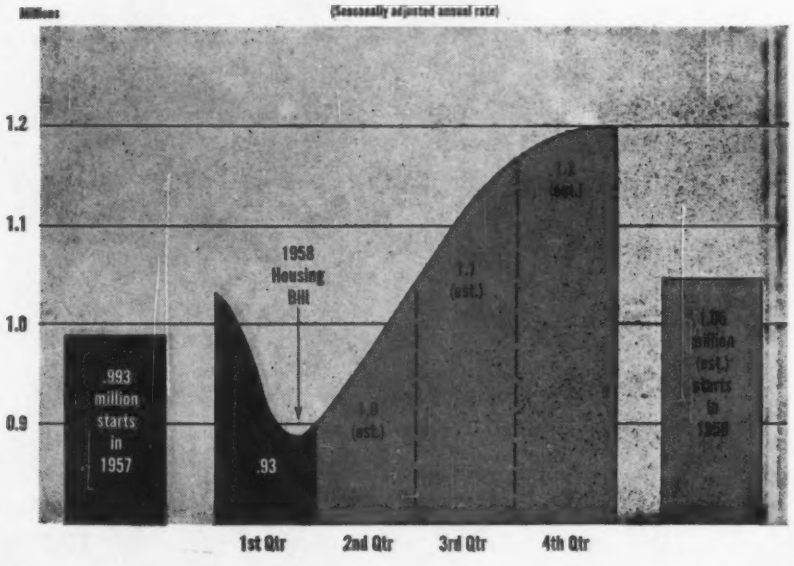
Housing shows definite signs of making a strong comeback by late '58. A conservative guess now would be 1.05 million starts—with some 600,000 coming on stream in the second half of the year. Housing has already had its own private recession. And the big booster is the new housing act.

The 1958 housing legislation is one of the strongest anti-recession moves taken by Congress so far. It provides for lower down payments on new homes, increases the size of mortgages that may be covered by FHA guarantees, hikes the interest rate on VA loans, and puts up a considerable sum of federal money ($1.3 billion) for the purchase of mortgages in the low-priced housing field.

Add to this the generally easier money conditions which have made the interest rates on mortgages competitive once again. Lenders now find the spread between yields on Aaa bonds and government-backed mortgages great enough to cover the higher cost of handling mortgages. And the new housing act should mean that they can find some borrowers. It authorizes FHA-insured loans with down payments as low as 3%. VA mortgages can be made with no down payment.

Of course, housing starts so far this year haven't been too impressive. January was a good month, but February and March slumped to an annual rate of less than 900,000. Unusually poor weather, caution among builders, some pessimism among consumers, and a "wait and see" attitude towards the pending housing bill explain most of the decline. April's starts rebounded to a 950,000 rate. And the surest sign of a stronger pick-up to come is on the FHA and VA front. Ap-

1958 Private Housing Starts



plications for FHA insurance in April were running 25% ahead of March, which in itself had set a 31-month record. Requests for VA appraisals last month zoomed up almost 200%. Conventional financing has also picked up.

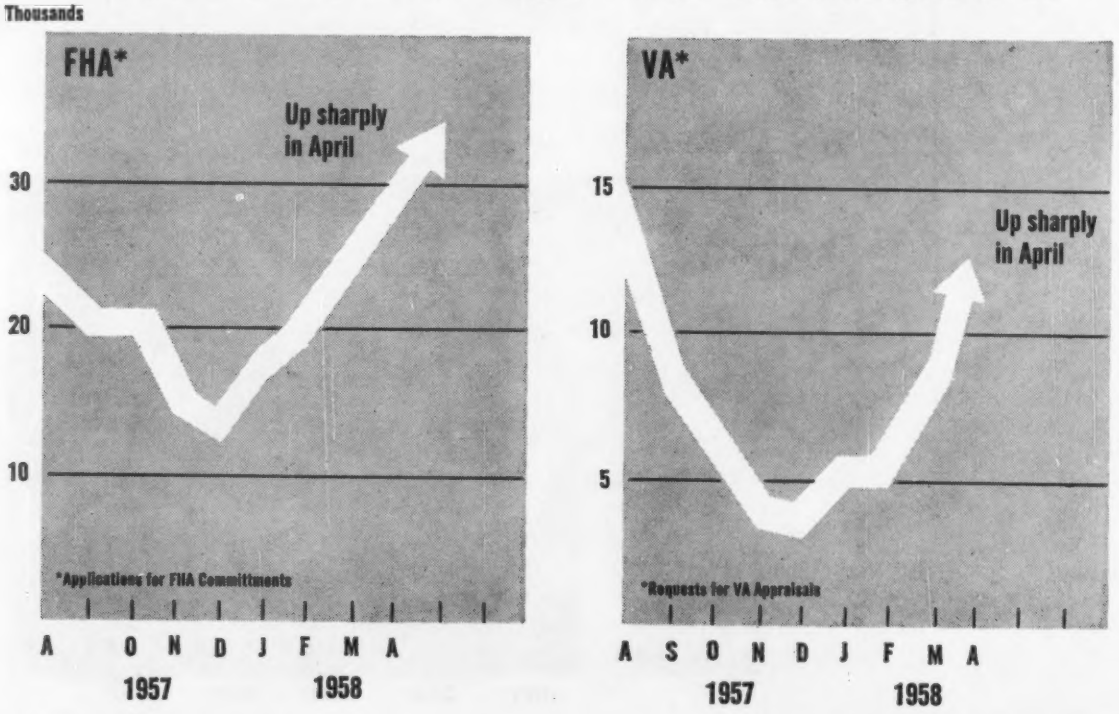
II. A Changing Housing Market

The big shift in housing is towards smaller, less expensive units. This doesn't stem from the recession, but from population trends. Main point is that the number of families in the 30-55 age bracket—the families with older children and rising incomes—will actually decline over the next few years. And the growing number of young and older couples tend to want smaller homes.

This trend dovetails nicely with the new housing legislation. A builder stands to gain from the liberal government financing only if he keeps his housing under $13,500. Noting the step-up in plans for such low-cost projects, Robinson Newcomb (one of Washington's leading housing consultants) predicts that the average prices of all housing in 1958 will not rise and may drop. This would reverse the sharply rising trend of recent years.

Apartments and mobile homes (trailers) are part of the economy drive. Together these two types of housing now account for more than 20% of all the units built, almost double the percentage in 1954. The $1-billion mobile home market is particularly intriguing, since the term "mobile" is a misnomer. It's been estimated that close to 90% of the trailers sold become permanent housing (although

Sharp pick-up in FHA and VA mortgages means strong housing late in '58



they are not counted in official housing start figures). And some experts think that the mobile home may be the forerunner of a low-cost, adaptable manufactured house. Not counting trailers, pre-fabs already account for about one out of every nine new single-family homes.

The strength in housing promises to persist into 1959 and beyond—no matter what form it takes. To a large degree, just how big a housing boom materializes depends on how well builders adapt to the changing market. With plenty of mortgage money, attractive design and pricing, and with new highways and urban redevelopment opening up new areas for homebuilding—the potential housing market should stay at 1.2 million over the next several years.

III. What Does It Mean to Appliance Sales?

A building boom does not guarantee an appliance boom. There's no direct conversion factor that can translate 1.05 million private housing starts into a given number of sales of dishwashers or food freezers; and any early pickup in appliances will be bucking the general trend for consumer durable goods, which always take it on the chin during a recession.

But an upturn in housing is bound to help appliance sales—in the long run, if not immediately. It should push up sales of built-in appliances (which are usually purchased by the builder before the house is sold). In addition, new home construction helps expand the market for appliances in two ways:

- **More houses mean more potential appliance buyers.**

- **New houses have more adequate wiring.** The rising percentage of homes with "full Housepower" is due partly to rewiring, partly to improved wiring standards in new construction. The National Association of Homebuilders has voluntarily adopted 100 amp as its minimum for service entrances.

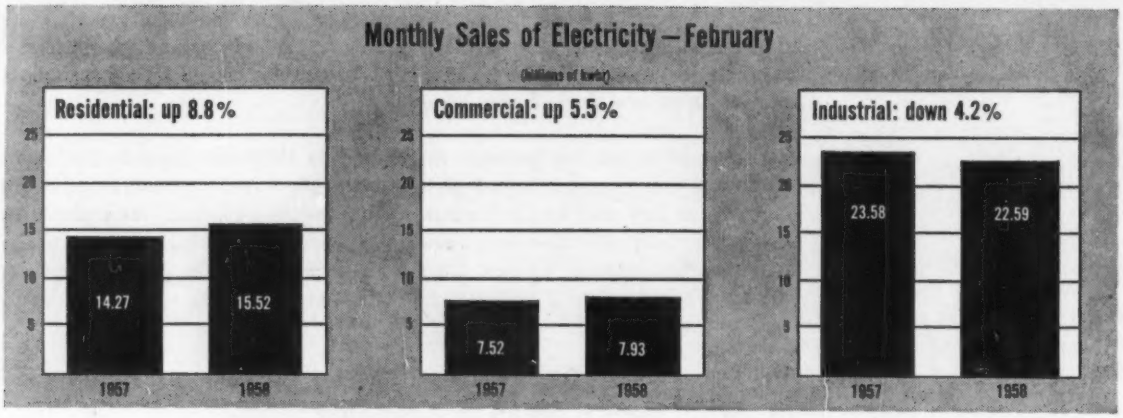
The Medallion Home program will give appliance sales an upward nudge. About 120,000 of these homes, which require four major appliances and encourage others, are expected to be built in 1958.

IV. What Does It Mean to Utilities?

New home building will brighten the brightest spot in the kwhr sales picture. During the first two months of this year, residential sales ran about 9% above the comparable 1957 period—offsetting the decline in industrial sales. An assist from new home construction will strengthen residential sales further. Total residential sales for '58 should hit around 160 billion kwhr.

New homes mean not only extra meters, but also greater average use per customer. It looks like average residential use will climb to about 3,380 kwhr this year. An all-electric home uses about ten times the kwhrs consumed by the average home today, and these homes are becoming more popular. More than 20,000 all-electric Gold Medallion homes are expected to be put in place this year.

Electric heating is also building residential load, as summer peaks creep northward. Utilities project that 321,000 resistance heating installations will be made in 1958—almost 11% more than last year. Heat pump installations are in for an even sharper rise—almost 60% to 37,000.



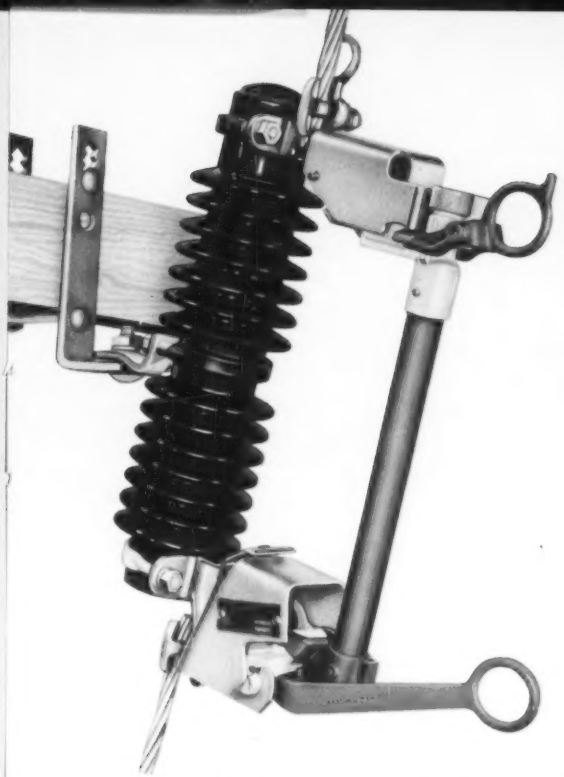
Power Statistics . . .

		Latest Month	Year Ago	Annual Change %
Capacity	Jan.	129.70	121.20	7.0
Peak—Class I Systems, million kw	Dec.	107.1	102.4	4.6
Estimated Dec. '58 Peak	Feb.	118.8	122.5	− 3.0
Production—billion kwhr	Jan.	55.36	55.50	− 0.3
Hydro		12.52	10.19	22.9
Fuel		42.84	45.31	− 5.5
Sales—billion kwhr	Feb.	48.48	47.77	1.5
Residential		15.52	14.27	8.8
Commercial		7.93	7.52	5.5
Industrial		22.59	23.58	− 4.2
Other		2.44	2.41	1.5
Fuel Consumption	Jan.			
Coal—million tons		14.80	15.98	− 7.4
Oil—million barrels		7.26	9.90	−26.7
Gas—billion cu ft		81.77	74.77	9.4
Net Income Class A & B Co's—$ million	Feb.	146.59	143.35	2.3
Residential Customers—millions	12 mos.	46.86	45.81	2.3
Revenue per kwhr	ended	2.55¢	2.59¢	− 1.5
Avg kwhr per customer	Jan. 31	3,197	2,986	7.1
Avg annual bill		$81.52	$77.31	5.4

Business Statistics . . .

Indexes: 1947–49 = 100				
FRB Industrial Production	Mar.	129	148	−12.8
ENR Construction Cost	May	157.6	150.0	5.1
BLS Cost-of-living	Mar.	123.3	118.9	3.7
New Orders for Machinery (1950 = 100)	Mar.	133	150	−11.3
NEMA Sales				
Insulation materials	Mar.	108	153	−29.4
Electric appliances		86	97	−11.3
Wholesale prices				
Motors and generators	Feb.	144.2	140.2	2.9
Transformers and regulators	Jan.	148.3	146.6	1.2
Switchgear and fuses	Jan.	171.3	164.4	4.2
GNP—annual rate—$ billion	4th qtr.	432.6	426.0	1.5

Significant changes: Signs of an appliance upturn are visible in NEMA's March index figure. Although sales ran 11.3% below a year earlier, the deficit is the smallest in four months.

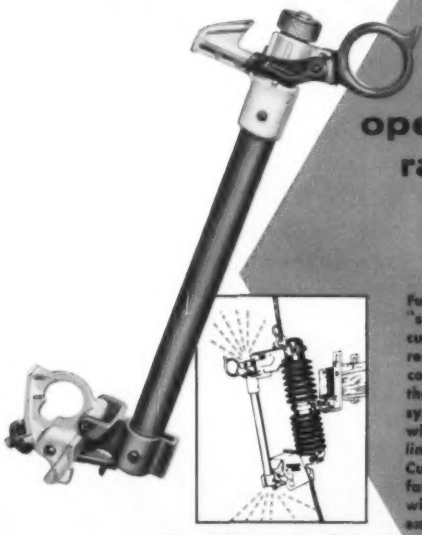


CHANCE *TYPE "F"* CUTOUTS

Here's what Utility Company Engineers say about Type F:
"It makes future system conversions simple and inexpensive... "I especially like being able to change from standard to load break... "It's ten times better than the cutouts we have been using ..."You have given us all the things we have asked for in a cutout."
But find out for yourself—compare the Type F, feature by feature, with the cutout you are using today.

THIS FUSE HOLDER

GIVES YOU PROVEN PERFORMANCE



over the entire operating range

Expendable cap gives the type "F" wide range operation on BOTH high and low faults.

Fuseholder design is the "secret" of dependable cutout performance regardless of the fault condition...performance that will protect your system from any fault with *any standard fuse link*. The Chance "F" Cutout *will* interrupt any fault within its rating with a low-cost, expendable fuse link.

A STANDARD FUSE LINK IS

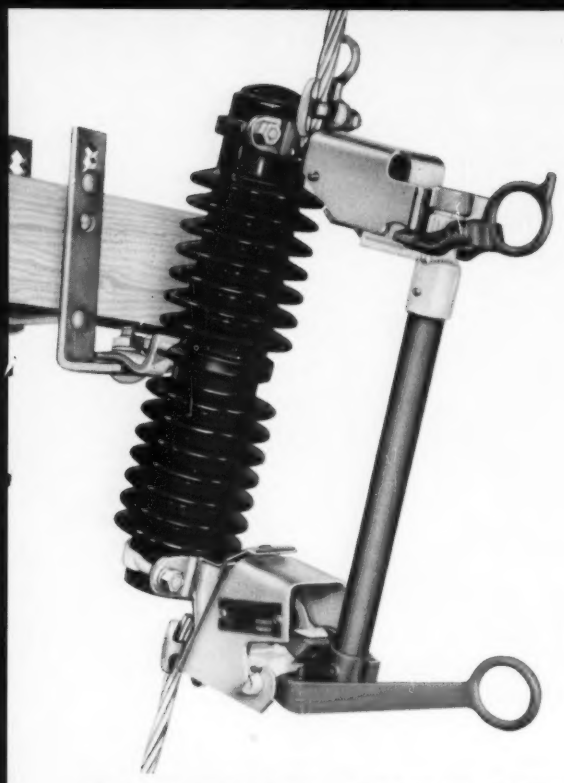
ALL YOU NEED

TO INTERRUPT

HIGH MEDIUM OR LOW

FAULT CURRENTS at 15 kv with the

CHANCE "F" CUTOUT



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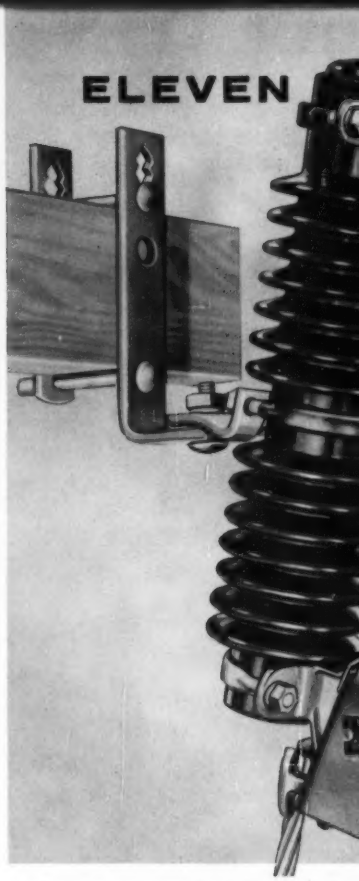


By simply changing the fuseholders, Cha
can be either regular or load-break, ar
interrupting capacities from 3,000 to
7.8 KV ratings and from 2,000 to 8,00

For 200 amp service you can purchase
or convert the 100 amp fuse mounting to
—just remove the contacts with a screw
them with 200 amp contacts and using

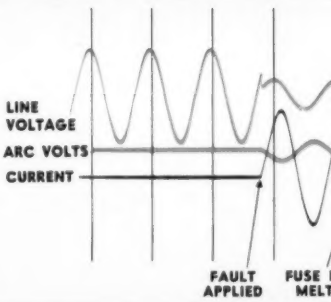
THIS FUSE HOLDER GIVES YOU PROVEN PERFORMANCE

over the entire operating range

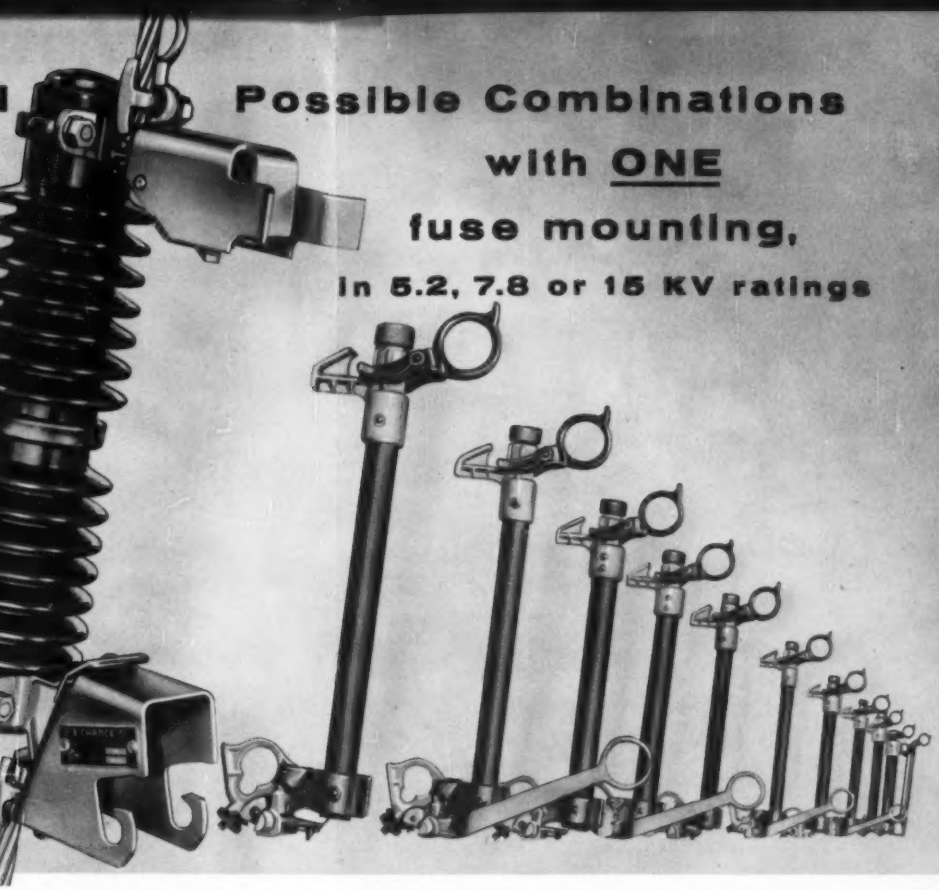
Expendable cap gives the type "F" wide range operation on BOTH high and low faults.

Fuseholder design is the "secret" of dependable cutout performance regardless of the fault condition...performance that will protect your system from any fault with any *standard fuse link*. The Chance "F" Cutout will interrupt any fault within its rating with a low-cost, expendable fuse link.

HERE'S HO



LOW CURRENT TEST — Melting time
cycle, Total clearing time — 2½ cycl
cat. no. FN-10-15 cutout with 6 amp
volt line, 20% power factor, 150 a



Possible Combinations with ONE fuse mounting,

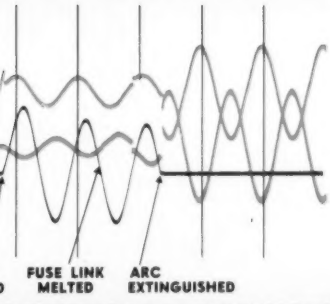
In 5.2, 7.8 or 15 KV ratings

ders, Chance 100 amp Type F Cutouts break, and can be altered to increase ,000 to 10,000 amps in the 5.2 and 0 to 8,000 amps in the 15 KV rating.

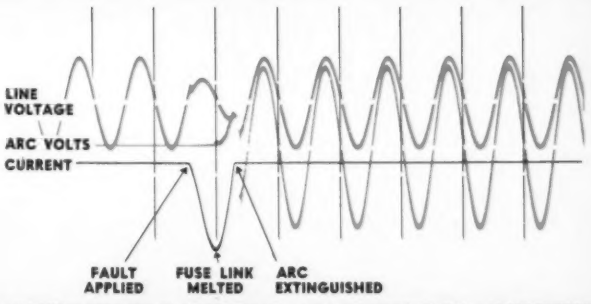
purchase 200 amp F Cutouts complete ounting to a 200. The change is simple n a screwdriver and wrench, replacing nd using 200 amp fuseholders of the desired voltage and interrupting capacity (4,000 or 12,000 amp interrupting capacity in 5.2 and 7.8 KV... 4,000 or 10,000 amp interrupting capacity in 15 KV).

The same solid disconnect blade can be used in either the 100 or 200 amp mounting to convert to a 200 amp disconnect switch. Thus there are eleven possible combinations with one fuse mounting to meet all your future requirements. To get full details, write for the booklet "What do you want in the CUTOUTS you buy?"

S HOW "F" CUTOUTS PERFORM ON HIGH OR LOW FAULTS!



ting time — 1½ cycles, Arcing time — 1 — 2½ cycles. This test was made using ith 6 amp. Type "K" fuse link; 14,400 or, 150 ampere overload.



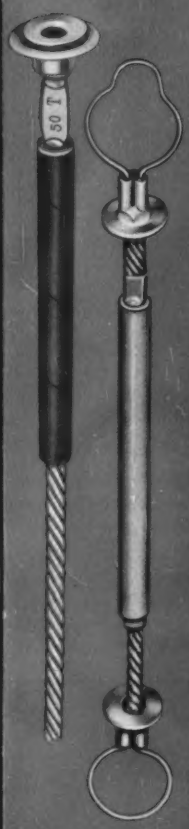
HIGH CURRENT TEST — Melting time — ¼ cycle, Arcing time — ¼ cycle — Total clearing time — ½ cycle. This test was made using cat. no. FX-10-15 cutout with 65 amp. Type "MS" fuse link; 13,600 volt line, 7% power factor, 8610 amperes.

CHANCE Fuse Links and Secondary Fuses

Engineered for system and equipment protection

for coordinated system protection

K & T FUSE LINKS

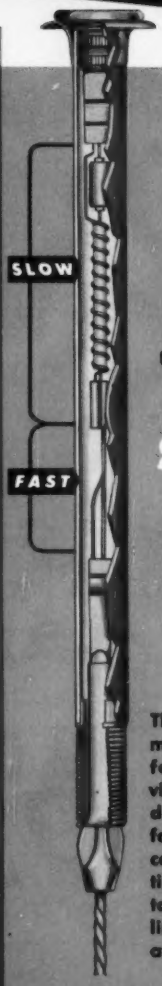


Precision manufactured to EEI-NEMA Interchangeability Standards

These fast (K) or slow (T) fuse links have the uniform quality needed for proper coordination.

Auxiliary tubes on links through 100 amps provide positive circuit interruption of low fault currents.

Low amperage links have a stainless steel ejection spring to further assure low fault current interruption.



for full overload capacity transformer protection without unnecessary outages

SloFast (Dual Element) FUSE LINKS

Follow the ASA safe loading curve for transformers

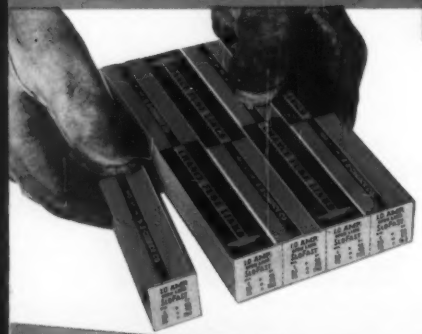
This exclusive Chance development permits full use of transformer overload capacity—virtually eliminates "burn-outs" due to overloads and secondary faults—isolates transformers in case of failure—improves continuity of service to your customers. Buttonhead and open link styles from 0.2 to 10.4 amps inclusive.

for complete secondary system fusing

Type CTSI Indicating Fuses

Here's secondary fusing that gives you protection from overload problems on your secondary systems . . . isolates failed capacitors or faulted sections—isolates transformers—localizes outages to help maintain customer service. Red plastic semaphore is released automatically when fuse element ruptures—can be easily spotted from the ground. From 5 to 200 amps inclusive. Available with insulated leads, as shown, or with bare leads.

All Chance Links and Fuses have exclusive lead-coated corrosion-resistant copper leads.



PACKAGED FOR EASY REMOVAL

Linemen can easily remove links from containers while wearing gloves. A slight firm twist separates the single container from the 5 unit container. The end of each unit container is perforated for quick removal of the link. Type and rating are clearly marked on both ends of each unit container.

Write for our new bulletin "FUSE LINKS AND HOW TO USE THEM." Address A. B. Chance Company, Centralia, Mo.

CK58-10

A·B·CHANCE CO·

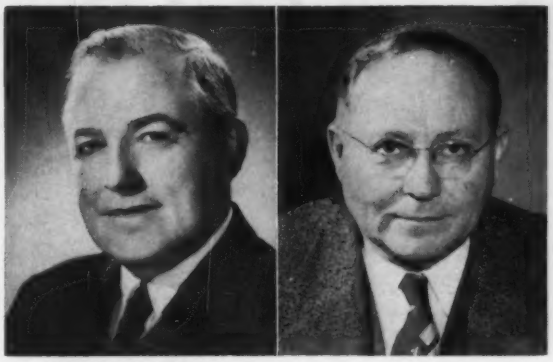
ABC INDUSTRIES

Gallagher and Hebel Get Top Indiana Posts

The newly created position of chairman and chief executive officer of Public Service Co of Indiana has been assumed by Robert A. Gallagher. He is succeeded as president of the company by Edmond W. Hebel.

Gallagher had been president since joining PSC in 1937. His utility career began in 1930 when, after varied accounting experience, he was made VP-comptroller of Consolidated Electric & Gas Co. In 1933 he became counsel on public utility matters for Continental Illinois National Bank & Trust Co, Chicago.

Hebel has been with PSC in legal and executive capacities for 24 years. A Harvard law graduate, he is a former general counsel for the utility. He has been executive vice president since 1954 and at present is also VP of Indiana Electric Association.



R. A. GALLAGHER E. W. HEBEL

PS of Oklahoma Elevates Canfield and Page

In key executive promotions, Public Service Co of Oklahoma has elected Wright Canfield as executive vice president and G. I. Page as vice president in charge of operations.

Until his new appointment, Canfield had been vice president since 1949. He was formerly assistant to the president. An engineering graduate of Oklahoma State University, Canfield is now vice president of Oklahoma Utilities Assn. He has been president of the Oklahoma Society of Professional Engineers.

Page has been superintendent of operations and construction for 12 years. He previously served as power station results engineer and as operating engineer for Southwestern Light & Power Co. Page is a Fellow in American Institute of Electrical Engineers.

W. CANFIELD G. I. PAGE

Three VP's are Elected At Missouri P&L

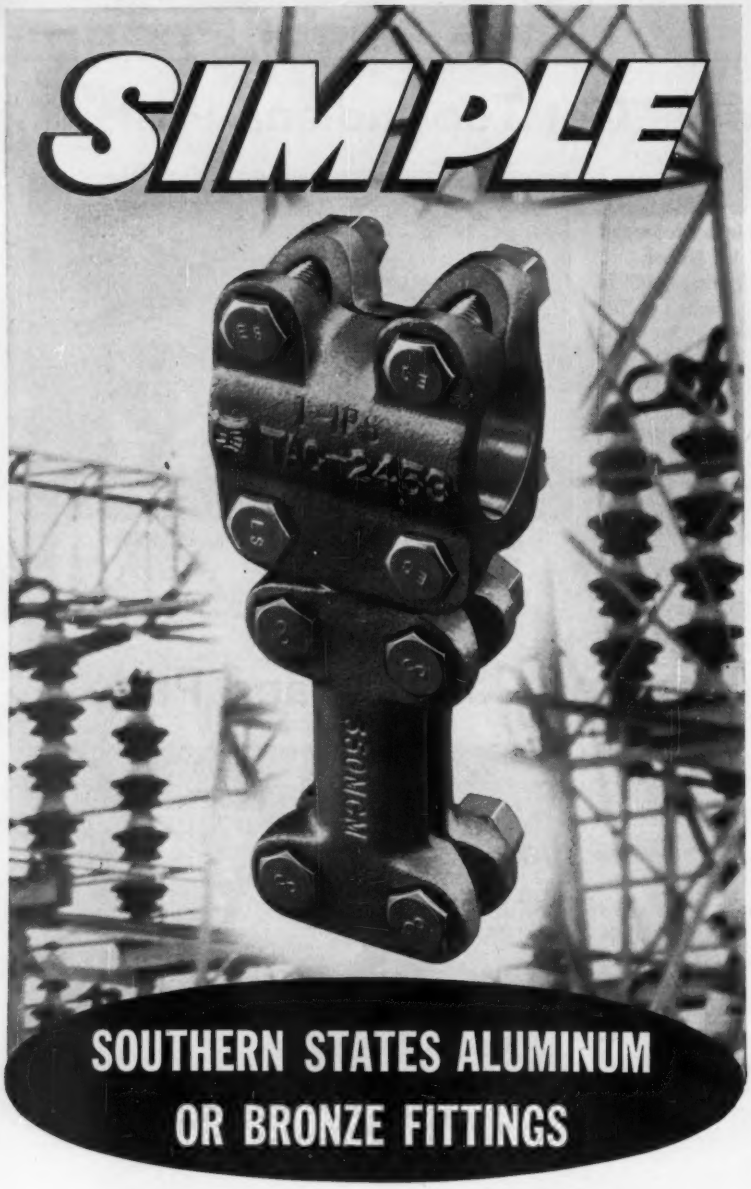
Missouri Power & Light Co has elected three new vice presidents. They are R. H. Dawson, R. L. Fike, and C. L. Hitt.

Dawson, who was also elected to the board of directors, will serve in the new position of vice president of operations. A 25-year veteran with the utility, he was chief engineer before his promotion.

Fike, former treasurer, will continue in that capacity as vice president. He has been associated with the utility for 22 years.

Hitt, a 33-year MP&L employee, becomes vice president-comptroller. He had been general auditor.

R. H. DAWSON R. L. FIKE C. L. HITT



The clean, simple lines of Southern States connectors didn't just happen. The recessed hexagonal bolt heads, or proven alloys, didn't either. Nor did the resultant over-all strength, ruggedness, and durability of these high-quality fittings. All of those characteristics, which you look for in connectors, are the result of careful engineering, backed by more than 25 years experience in producing these products — from drawing board, to foundry, to you.

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

CIPS Elects VP

At Central Illinois Public Service Co, the board of directors recently elevated R. H. Thompson to the post of vice president of the utility.

In his new capacity, Thompson will continue his former duties as manager of the Eastern Division.

Wagner Ups Three

BROWN

FORD

HACKETT

Wagner Electric Corp has promoted G. W. Brown from vice president to executive vice president of the company.

In addition, Paul C. Ford was elected as vice president in charge of engineering and research and R. H. Hackett as vice president in charge of manufacturing operations.

Brown, engineering and research VP since 1954, has held numerous engineering and management positions during his 32 years with Wagner.

Lock Advances

R. L. Lock, engineering VP at Anderson Electric Corp, has also been named research director. Move is part of expanded research plan.

• Four years ago, this right-of-way in Kentucky was sprayed with Du Pont "Ammate" X weed and brush killer. Long-term control of brush, like this, results in lower maintenance cost on rights-of-way.

Control brush for years...without crop injury with one application of **Du Pont AMMATE® X**

WEED AND BRUSH KILLER

Du Pont "Ammate" X assures lower-cost, longer-term brush control, because when the original spray job is done well, only occasional spot sprays are required to keep brush under control for years. And you can use "Ammate" X on rights-of-way, even when they adjoin cropland planted to sensitive crops like cotton, soybeans, tobacco, tomatoes and peanuts. "Ammate" X is easy to use, and not hazardous to applicators, livestock or wildlife. As a foliage spray, "Ammate" X kills more kinds of brush and keeps it down longer than any other known herbicide.

For more information, write for free full-color booklet that shows the results of applications of "Ammate" X.

E. I. du Pont de Nemours & Co. (Inc.)
Grasselli Chemicals Dept., Rm. 4032-D
Wilmington 98, Delaware

On all chemicals follow label instructions and warnings carefully.

Here's What Users Say About AMMATE X

High Per Cent of Kill . . ."We adopted a systematic five-year program for our right-of-way spraying in 1953 after conducting experimental tests in the late forties and early fifties. We are well pleased with the high per cent of kill that we are now getting through the use of 'Ammate' X on the rights-of-way brush on our system, which is predominantly in a mountainous area. We fully recommend 'Ammate' X for the control of brush on all systems with comparable terrain."

W. L. WHITWORTH, *Manager*
Sequachee Valley Electric Cooperative, South Pittsburg, Tenn.

No Crop Injury . . ."Since we have been using 'Ammate' X for spraying brush along our electric lines, we have not had any injury occur to susceptible crops—cotton and soybeans—grown on farms adjacent to our lines."

FLOYD JONES, *Manager*
Gibson County Electric Membership Corp, Trenton, Tenn.

Reduce Line-Maintenance Expenses..."We have had 'Ammate' X applied to our Rural Electric right-of-way for three years. Since brush control is our main line-maintenance expense, we believe 'Ammate' X will considerably reduce this expense in future seasons."

H. C. GANGWER, *Manager*
Fort Louden Electric Cooperative, Madisonville, Tenn.

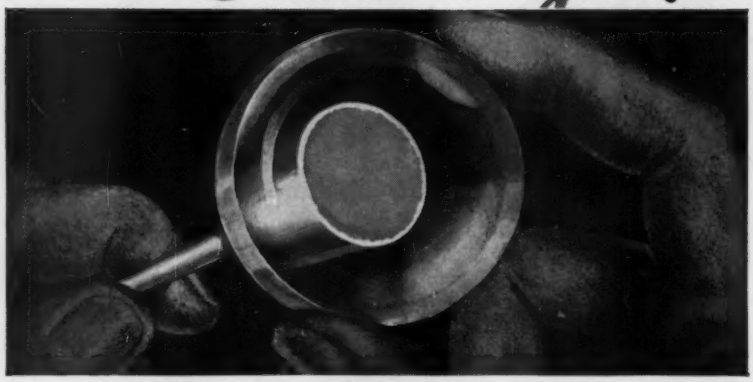
DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

It's NEW!

Wire that combines the strength of steel with the high corrosion resistance of aluminum

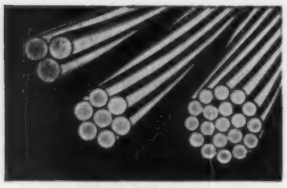
It's ACCO *Aluminized!*



PAGE STRAND

PAGE has successfully combined two time-tested metals into a revolutionary new wire—ACCO ALUMINIZED—that has a ductile, protective coating of aluminum *bonded* to iron and steel wire by a hot-dip method. This product is covered by and is manufactured under processes covered by U.S. and foreign patents.

Now PAGE offers ACCO ALUMINIZED Steel Strand for guy wire, ground wire and messenger wire applications. Can be used with Preformed Guy-Grip dead-ends made of ACCO ALUMINIZED Wire, or with galvanized pole hardware. Here is evidence of ACCO ALUMINIZED Steel Strand's superiority: salt spray tests conducted in strict accordance with ASTM procedures show that, for equal thickness of coating, aluminized *outlasts galvanized by more than 2 to 1.*



ALL STANDARD GRADES

PAGE ACCO ALUMINIZED Steel Strand is available in Common, Siemans-Martin, High Strength, Extra High Strength and Utility grades with physical properties meeting ASTM Spec. A-122-54-T and A-363-55-T.

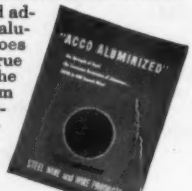
NOTE: We will continue to make and market PAGE Stainless Steel Strand and PAGE Galvanized Strand, as heretofore, in 3-, 7- and 19-wire construction.

Also...PAGE *Aluminized* ACSR CORE WIRE

Aluminum Conductor Cable with PAGE ACCO ALUMINIZED ACSR Core Wire is now available from many manufacturers of conductor cable. Product quality control is assured by a special testing procedure mutually developed by PAGE and ALCOA.

Send for Informative Booklet

How about ductility and adherence properties of aluminized wire? Why does aluminizing create a true duplex coating over the core? How does aluminum "sacrifice itself" to provide electrochemical protection? For answers, write us at Monessen, Pa., asking for **Booklet DH537-A.**



ACCO for Better Values

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

ACCO TRADE MARK

BRENNER CONBOY

New VP's Names

Penn-Union Electric Corp has elected Morris Brenner as vice president of engineering and Fred T. Conboy as vice president-sales.

Brenner, who joined Penn-Union in 1956, was previously with Burndy Corp in Norwalk, Conn.

Conboy, a Penn-Union employee since 1936, most recently served as sales manager of the company.

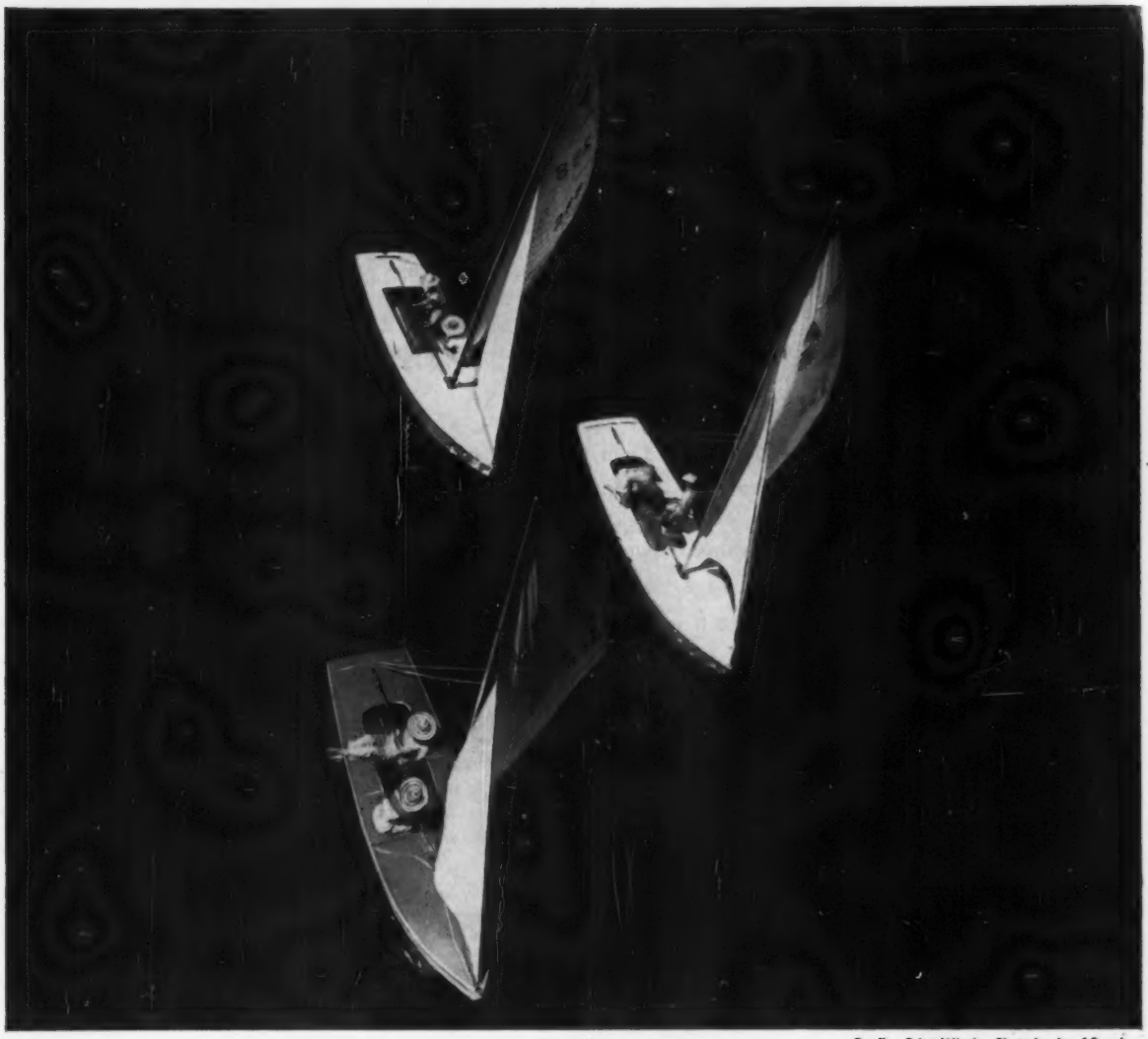
PERSONAL BRIEFS

Herbert E. Blachford is new assistant secretary of Detroit Edison Co. He remains assistant director of the tax dept . . . **Thomas E. Hurns** has retired as vice president and secretary of the utility.

At United Gas Improvement Co, **John H. Mackenzie** will become secretary and treasurer on July 1, upon the retirement of **Johns Hopkins. Albert W. Terry** was elected assistant secretary and assistant treasurer.

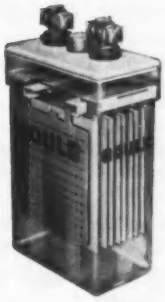
Clarence W. Anthony has been made manager of operations for Oklahoma Gas & Electric Co . . . At Kansas Power & Light Co, **Burke Wright** has been named to the new post of systems planning engineer. He will plan for electric systems growth, including generation and transmission facilities.

R. N. Robertson will become assistant director of Florida Power Corp's residential development dept June 1 . . . **Frederick C. Shaughnessy** was recently elected a vice president of Consolidated Telegraph & Electrical Subway Co. He is general distribution manager of Consolidated Edison Co.



Graflex Prize-Winning Photo by Josef Scaylea

Battery Users Report "Smoother Sailing" *with* **gould** *batteries*



America's Finest!
GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

It's true! Gould's files bulge with case histories of battery users who have discovered exceptional economy and dependability in Gould Batteries. The reasons are simple: (1) Gould's battery research is the most *thorough* in the world; (2) Gould's manufacturing techniques have been patiently developed for the utmost precision and control; and (3) Gould's large field engineering staff makes routine inspection trips to insure that your batteries are getting the proper care. Want more reasons? . . . write for booklet ". . . so you're going to buy an industrial battery."

Gould-National Batteries, Inc., Trenton, N. J.

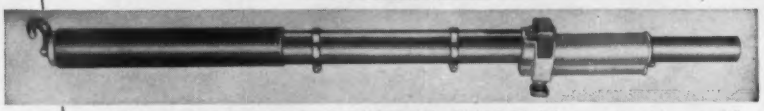
More Power to you from Gould

Always Use Gould-National Automobile and Truck Batteries

©1958 Gould-National Batteries, Inc.

BODENDIECK'S NEW

fiberglas shotgun



Permanently sealed TUBULAR FIBERGLAS construction with external FIBERGLAS control rod providing:

- LIGHT WEIGHT—8 ft. model weighs 5½ lbs.
- HIGH DIELECTRIC—100 KV ea. ft. 5 min. test.
- LOW MOISTURE ABSORPTION—Not affected by surface scratches.
- LOW UPKEEP—No refinishing required.
- LONG SAFE LIFE—Components non-deteriorating.

NOW AVAILABLE: 4 ft., 6 ft., 8 ft. and 10 ft. lengths.

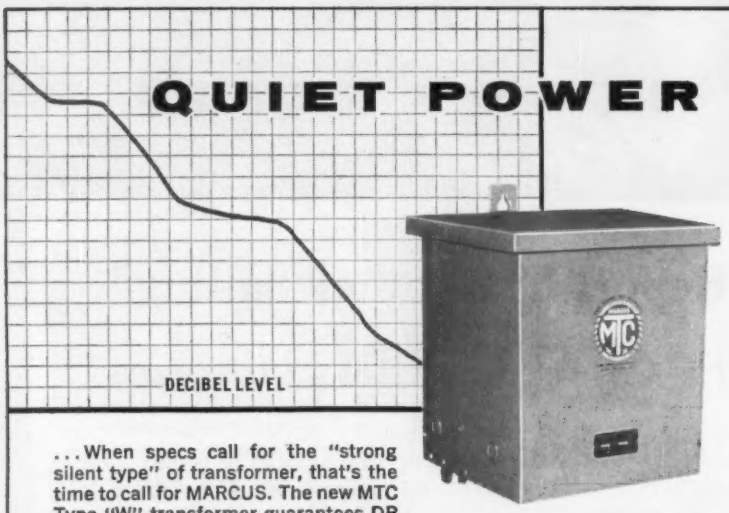
▶ Your inquiries covering this and other quality BODENDIECK products are invited. Prices and specifications promptly sent on request.

CHECK TOOLS

BODENDIECK TOOL CO.

TAYLORVILLE, ILLINOIS

QUIET POWER



...When specs call for the "strong silent type" of transformer, that's the time to call for MARCUS. The new MTC Type "W" transformer guarantees DB LEVELS THAT ARE BELOW NEMA STANDARDS. So for those extra quiet installations, Specify MARCUS---- Proven quieter by independent laboratory test.

- LOWER SOUND LEVELS
- LOWER WEIGHTS
- LOWER INSTALLATION COSTS

MARCUS TRANSFORMER CO., Inc.

RAHWAY, NEW JERSEY

"Mark of Quality"

Representatives in Principal Cities

A COMPLETE LINE OF DRY-TYPE AND LIQUID-FILLED TRANSFORMERS FROM 1 THROUGH 5000 KVA.

Wisconsin Electric Power Co VP **Floyd L. Larkin** has been elected president of Wisconsin Utilities Assn . . . New president of Montana Society of Engineers is **Donald E. Kampschror** of Westinghouse Electric Corp.

Commonwealth Edison Co's transmission and distribution engineering depts were recently consolidated under **John Davis,** system transmission and distribution engineer, and his assistant **Victor Bernthal** . . . **Francis Cox** has been appointed division commercial manager, Chicago-South; **Ed Doyle,** division commercial manager, Chicago-North; and **Phil Smith,** assistant division operating superintendent, Chicago-North.

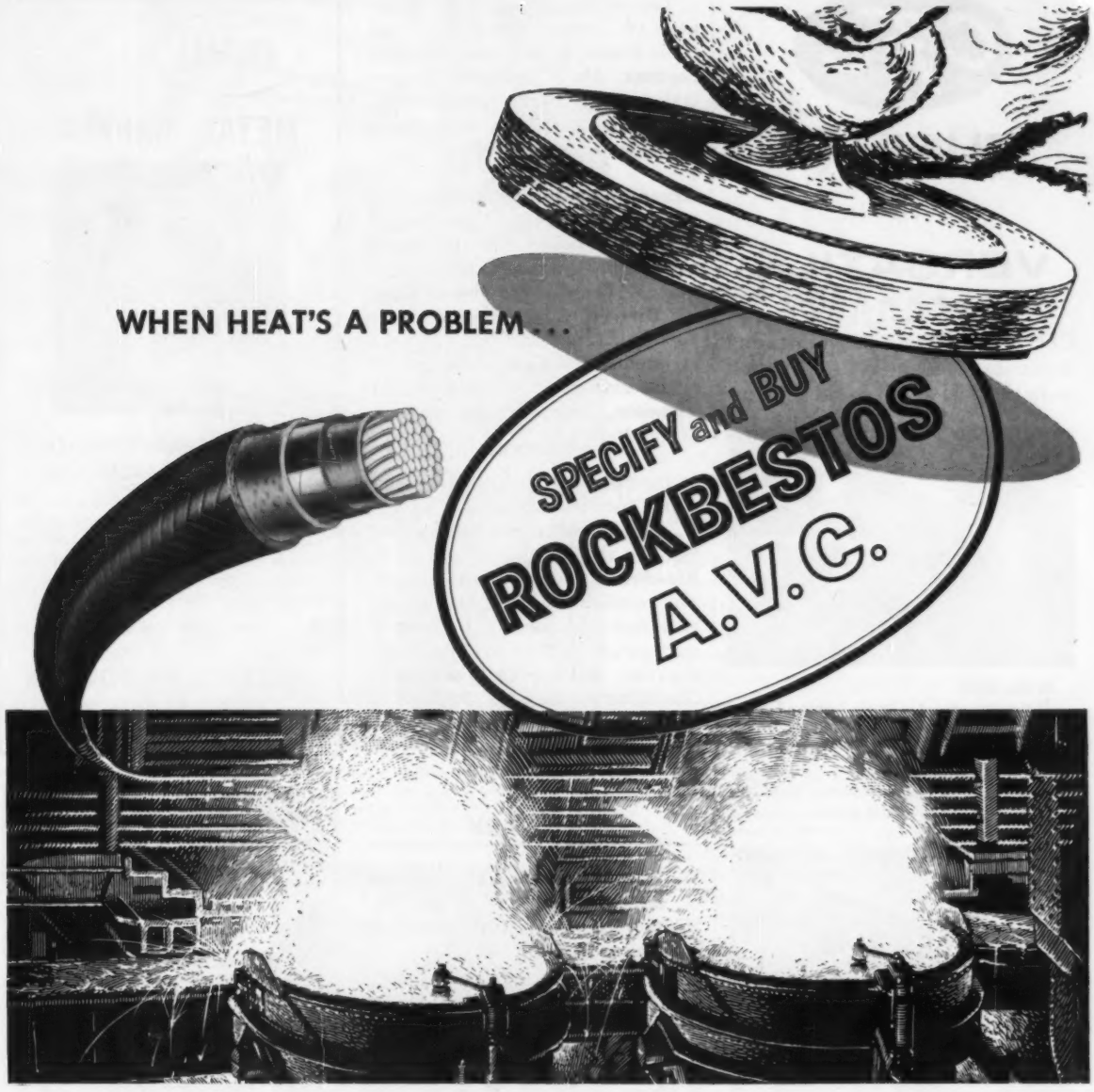
The new position of structural engineer for Connecticut Light & Power Co has been assumed by **Charles M. MacWilliam.** He will continue his present duties as hydraulic engineer.

In a reorganization of its system operations and production depts, Public Service Co of Indiana, Inc, has named **E. C. Woods** as system services and operation director; **Fred E. Nicoson** as power production director; **M. W. Kintz** as power production superintendent; and **W. F. Nelson** as power engineering manager.

Wisconsin Electric Power Co has announced that Secretary-Treasurer **John Dockendorf** has relinquished the treasurership and has been elected secretary and assistant treasurer. **Harold P. Chamberlin** is new treasurer and assistant secretary.

Thomas O. Millard has been made chief electrical engineer for Pioneer Service & Engineering Co . . . Sangamo Electric Co recently named **Glenn DeKraker** assistant marketing manager.

American Institute of Electrical Engineers recently elevated these members to the grade of Fellow: **W. F. Dunkle** of Pennsylvania Power & Light Co; **Arthur M. Harrison** of Westinghouse Electric Corp; **Chester L. Osenbaugh** of Memphis Light, Gas & Water Division; and **Millard C. Westrate** of Commonwealth Associates, Inc.



Steel Mill and Foundry "hot spots" provide one of industry's worst torture chambers for wire and cable. Heat, overloads and corrosive fumes combine to kill ordinary cable quickly.

Don't take a chance on ordinary cable for troublesome "hot spot" applications. *Specify and use Rockbestos A.V.C.*

This superior AVA cable, with asbestos, varnished cambric insulation, takes temperatures up to 230°F, assuring continuous operation in hot spot applications, provides greater current carrying capacity for increased and new loads.

When you *specify and buy Rockbestos* A.V.C., you reduce your electrical maintenance and construction costs . . . you get years more dependable service.

Write now for the new Rockbestos RSS-88 to help you *specify and buy Rockbestos* A.V.C.

ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT • CHICAGO • OAKLAND
PITTSBURGH • ST. LOUIS • LOS ANGELES • SEATTLE • ATLANTA • DALLAS

ROCKBESTOS A.V.C.

THE SUPERIOR A.V.A. CABLE

CFC

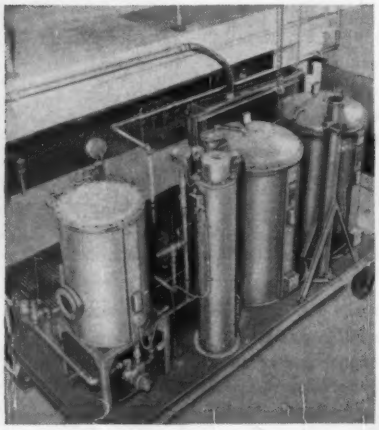
PURIVAC

IS

VERSATILE

CFC Purivac filters, dehydrates and degasifies in one automatic operation — in the field or at central stations.

In the field:
Mounted in a truck, this CFC Purivac is used by Omaha Public Service District to treat all oil-filled electrical equipment at 300 substations. Over 1200 pieces of equipment are served — some located 55 miles from the main plant.



At a central station:
This CFC Purivac reclaims over 200,000 gallons per year of insulating oil for Public Service Company of Indiana.

CFC Purivac is effective, safe, versatile, economical. Write for Bulletin 804 to Department EW.

COMMERCIAL FILTERS CORPORATION
Melrose 76, Massachusetts
Plants in Melrose, Mass. and Lebanon, Ind.

The engineering services component of General Electric Co has made **Ernest E. Johnson** consulting engineer. He is succeeded as general manager of the general engineering laboratory in Schenectady by **James F. Young.**

Alfred D. Burke is new general sales manager of specialty products dept for Westinghouse Electric Supply Co's apparatus and supply division . . . In the Westinghouse Gearing Division, **F. Richardz** has been appointed consulting specialist, gearing products; **R. L. Mathias,** division engineering manager; and **R. H. Timmons,** manufacturing manager of the division.

In the electrical application dept of Allis-Chalmers Manufacturing Co, **W. E. Gutzwiller** has been named assistant to the manager and **T. H. Bloodworth,** chief systems engineer. The rectifier section of the department has advanced **D. B. Scott** to manager; **J. B. Rice** to chief design engineer, and **Harold Winograd** to consulting engineer . . . **Richard L. Engel** is new manager of the Industries Group's Pacific region.

OBITUARY

Wallace L. Cook, 78, chairman of Reliable Electric Co and the Whitney Blake Co, died recently at his Chicago home.

Claude Draper, 82, a Federal Power Commission member from 1930 until 1956, when he retired, died recently in Walter Reed Hospital, Washington, D. C.

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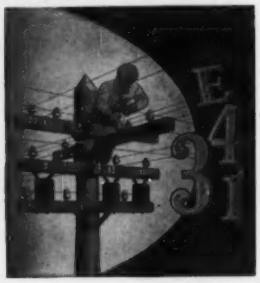
Field Service, INC.
P. O. Box 1581 Okla. City
Thoroughly Specialized
RIGHT-OF-WAY ACQUISITION
From Title Search . . .
To Damage Claims

PREMAX
METAL MARKERS



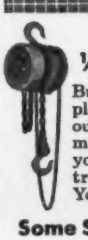
NEED NO MAINTENANCE AFTER INSTALLATION

Find out about all the features of economy, long wear and clear legibility that Premax offers in stamped and embossed tags, letters and figures of aluminum or brass. Ask your jobber, or write Premax direct.

Premax Metal Markers are R.E.A. Approved.

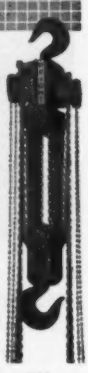
PREMAX PRODUCTS
Div. Chisholm-Ryder Co., Inc.
5817 Highland Ave., Niagara Falls, N. Y.

WRIGHT SAFEWAYS
Your Best Buy for Rigging and Maintenance Work



12 Sizes
½-ton to 50 tons

Bulletin 412A gives complete details on the many outstanding features that make Wright Safeways your best buy for long, trouble-free life. Write York, Pa. for your copy.



Some Safeway Features

Load Chain is finest alloy, every foot proof-tested...heat treated for hard wear-resistant working surface...ductile to withstand shock loads..."wick" lubricated...anti-rust zinc coat.

Load and Idler Sheaves rotate on life-lubricated, antifriction bearings...minimum of 5 pockets in Big Sheaves for efficiency and long life.

Gears, Pinions, Drive Spindle (also top and bottom Hooks) are nickel-chrome-molybdenum alloy steel mounted on heavy-duty, antifriction bearings. *Gear Train* is enclosed in oil-tight chamber.

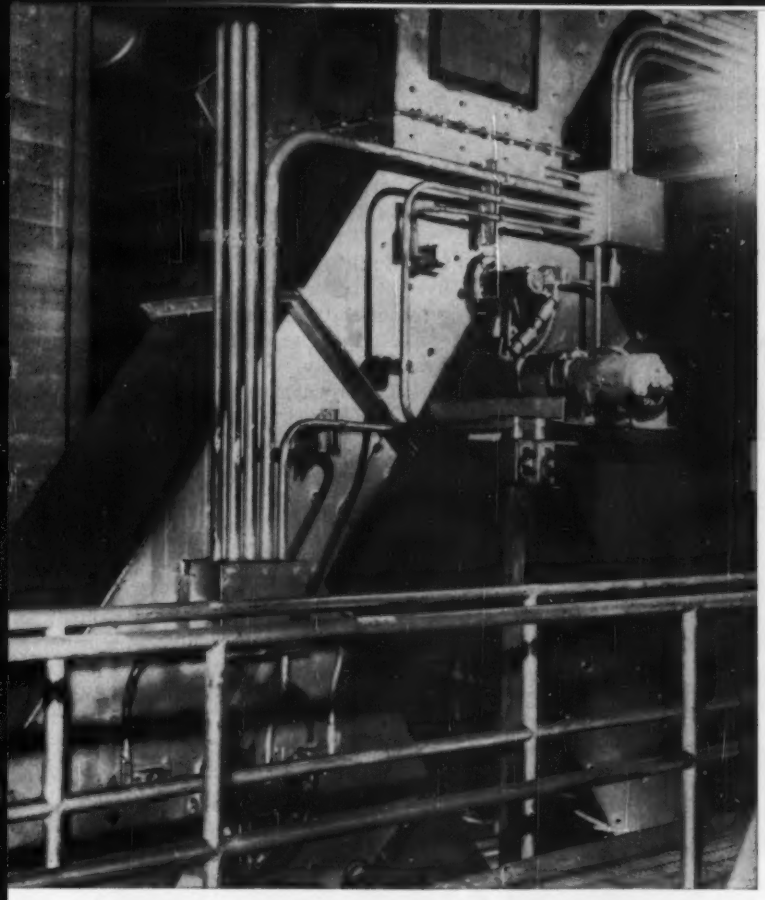
Load Brake is Weston type, silent, dependable.

Steel Housing fully protects vulnerable parts.

ACCO

Wright Hoist Division
AMERICAN CHAIN & CABLE
York, Pa., Bridgeport, Conn.

How USS "T-1" Steel is used for **cost reduction** in power plants



Longer life for coal chute liners. USS "T-1" Steel's high resistance to impact abrasion has doubled, tripled and even quadrupled the life of chutes handling highly abrasive materials such as coal, cinders and ore. "T-1" Steel furnished to 321 minimum Brinell has been particularly effective in this service.

Over a ton of weight saved on this lighter-weight portable transformer. Shell thickness was reduced from ⅜ to ¼ inch by designing to USS "T-1" Steel's greater strength.

60 per cent savings in material costs were realized by making these small turbine rotor discs from USS "T-1" Steel which has a yield strength of 90,000 psi minimum.

Power plants are caught in the cost squeeze like every other industry. But if you can make your equipment last longer by using better steel, you can save a substantial number of dollars.

USS "T-1"* Constructional Alloy Steel has an amazing combination of properties that can cut costs in numerous ways:

- **Minimum yield strength of 90,000 psi NRM—permits stronger construction with large savings in weight.**
- **Outstanding resistance to impact abrasion—increases equipment life.**
- **Exceptional toughness even at 50° below zero temperature—reduces maintenance costs.**
- **The 4 times greater atmospheric corrosion resistance increases service life.**
- **Ready weldability and formability—reduces construction costs.**
- **Lower transportation charges—because fewer tons are shipped to job sites.**

All this means that materials handling equipment can last two or three times longer when built of USS* "T-1" Steel. And wherever impact abrasion is particularly severe, USS "T-1" Steel may be furnished quenched and tempered to 321 minimum Brinell hardness for maximum performance.

Other savings have shown up in a variety of ways—lighter construction, lower fabrication costs, smaller foundations, considerably less maintenance, fewer outages, less freight and lower erection costs.

Consider USS "T-1" Steel for use in handling and storage equipment, pressure vessels, scroll cases, penstocks. Write for our book, *USS "T-1"*, which gives the complete story. United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

Immediate Delivery. Our new continuous plate heat-treating line offers solution to your delivery and quality requirements. Therefore, there is no tonnage restriction on plates, and as little as three tons of "T-1" Steel bars may be purchased directly from the mill.

*TRADEMARK

United States Steel Corporation – Pittsburgh
Columbia-Geneva Steel – San Francisco
Tennessee Coal & Iron – Fairfield, Alabama
United States Steel Supply – Steel Service Centers
United States Steel Export Company

United States Steel

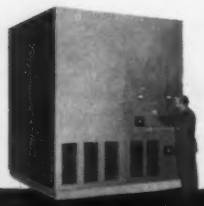
PREFERRED

Sel-Rex®

CUSTOM ENGINEERED

RECTIFICATION

- Germanium
- Silicon
- Selenium



Of the thousands of Sel-Rex Rectifiers in use, a large percentage are "repeat orders"—units purchased only after an original installation had thoroughly proven itself.

Our users include the country's foremost electrical and electronic concerns* — companies best qualified to evaluate rectifier equipment.

*names on request

Send for FREE "GUIDE" to Industrial Rectifier Equipment.

Rectifier Division

SEL-REX CORPORATION

NUTLEY 10, NEW JERSEY

Representatives in Principal Cities

"Complete Semiconductor Power Conversion Systems for any AC to DC application"

We

are pleased to announce that
American Gas and Electric Company
has adopted a new corporate name

American Electric Power Company, INC.

For many years the business of American Gas and Electric System has been exclusively electric. The new name has been adopted to identify more accurately our business and our service.

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providing electric service to 1,350,000 customers in these seven states: Michigan, Indiana, Ohio, West Virginia, Virginia, Kentucky, and Tennessee

Through these six operating companies:

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Indiana & Michigan Electric Co.
Kentucky Power Company
Kingsport Utilities, Inc.
Ohio Power Company
Wheeling Electric Company

Paxton Interview

(*Continued from page* 71)

What's in prospect for GE on upcoming labor negotiations?

We worked out in 1955 negotiated settlements which provide a five-year program of benefit improvements and annual wage increases. Purpose of the settlement was to specify two series of wage and benefit advances—one for the 1955-58 period and another for 1958-60. There can be no bargaining this year on these or other matters covered by our 1955 agreements. Thus, in 1955 we completed our 1955-60 bargaining, except for the limited 1958 reopener to consider "proposals for contracting on any questions directly relating to employment security which may be submitted to the union or the company." GE expressed its attitude toward SUB plans in our 1955 letters outlining our offer to the unions which stated explicitly that from anything we could then anticipate, we would in 1958 be just as firm in our conviction as in 1954 and 1955 that "unemployment compensation supplementation or any similar proposals are not in the balanced best interests of all concerned in GE . . ."

We are willing to listen to all union proposals claimed to be related to employment security—but only on the basis that this would not be interpreted as an inclination on our part to scrap any provisions of our contract and start bargaining all over again on things upon which we already reached agreements in 1955. We will study all factors pertinent to the 1958 reopener negotiations and maintain an open mind to any suggestions offered by the union.

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Are You Preparing *Now* For The Next Boom?

America's leading companies are not sitting on their hands waiting for the recession to end. They are planning ahead ***now*** for higher sales and near-capacity rates of operation.

These facts stand out clearly from the eleventh annual survey of Business' Plans for New Plants and Equipment just completed by the McGraw-Hill Department of Economics:

- **Manufacturing companies expect their sales to increase 20%, on the average, from 1958 to 1961.** Growth industries, such as chemicals and electrical machinery, expect gains of 25% to 34%.
- **If these sales gains are achieved, the average rate of operations in manufacturing will rise from 78% at the end of 1957 to almost 85% by 1961.** This is the point at which pressure on costs begins to mount, as less efficient facilities are pressed into service.
- **Industry is not waiting for this point to begin getting its plants and equipment in shape for the next boom.** Despite record expansion in the past several years, many manufacturing companies plan to add new capacity in each of the next four years. But, more important, they are going ahead with the vital job of modernization and cost-cutting.

In the years immediately ahead almost two-thirds of capital investment will go for modernization and replacement of present plants and equipment. In this way manufacturing companies can avoid the higher costs and the squeeze on profits that occur when producing facilities are not in shape to handle an increase in sales volume.

These are the plans, as reported to McGraw-Hill, of a wide sample of manufacturing companies—for the most part, large firms and leaders in their respective industries. Altogether, these firms account for almost 40% of all employment in manufacturing industries.

Now Is The Time

How do your plans measure up? Are you planning ahead now for a 20% sales increase in the next three years? Is your company planning to modernize its buildings and equipment more rapidly than at any time in the recent past? If not, here are some of the inducements

that McGraw-Hill editors report from their continuous checking on the state of business.

(1) **There are plenty of opportunities for increasing efficiency by the installation of new equipment and the improvement of layouts in plants, warehouses and offices.** Despite the installation of tremendous volumes of metalworking equipment in recent years, according to AMERICAN MACHINIST over half of the machine tools now in U. S. factories are over 10 years old. Replacement of worn-out and obsolete equipment will mean material savings in operating and maintenance costs.

(2) **Machinery, parts, materials and labor are much more readily available now than they are when the economy is running at full steam.** You can be more particular about quality and about specification to meet your own requirements.

(3) **With lower interest rates and less competition for loans, it is both easier and cheaper to borrow money to finance equipment and construction.** To wait for another boom is to run the risk of having to pay higher interest rates and look harder for money.

(4) **Although there is an adequate supply of most types of labor available now, the prospect is that the supply of factory labor over the years ahead will be tight.** In 1965, there will actually be fewer men and women between the ages of 25 and 44 than there are now. Good factory workers will be either hard to get, or wage rates will rise sharply or—more likely—both. The best answer is to anticipate the rise in labor costs by installing more efficient equipment to increase labor productivity.

(5) **Finally, the costs of investing in new buildings and improved equipment *now* are almost surely less than they will be later.**

These are some of the reasons why many leading firms find ***now*** the best time in years to start on a program of plant modernization. There are other good reasons in the many new products and processes coming from the boom in research and development. This year industry will spend over $8 billion on R & D—$1 billion more than in 1957. And a heavy share of the new product development will consist of better machines and processes to be made available during the next few years. Already the pace of technical advance is so rapid as to call for modernization of plants built only a few years ago.

Years of Opportunity

It has been said that the years between now and 1961 are the "middle years" between two booms. This does not mean a long period of recession, but a period of slower growth—a transition from the postwar boom based on deferred demand, to a new boom in the 1960s based on dynamic population growth and a revolution in technology.

If so, these are the years of opportunity for business—opportunity to prepare for the growth that lies ahead with the most efficient equipment, the most modern plant and the best production organization that can be devised. This is the way to fight higher costs and avert a resumption of inflation. This is also the way to ensure that your company will be ready for its new markets in the 1960s.

Are you planning ahead ***now*** to be among the leaders?

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C McGraw

PRESIDENT

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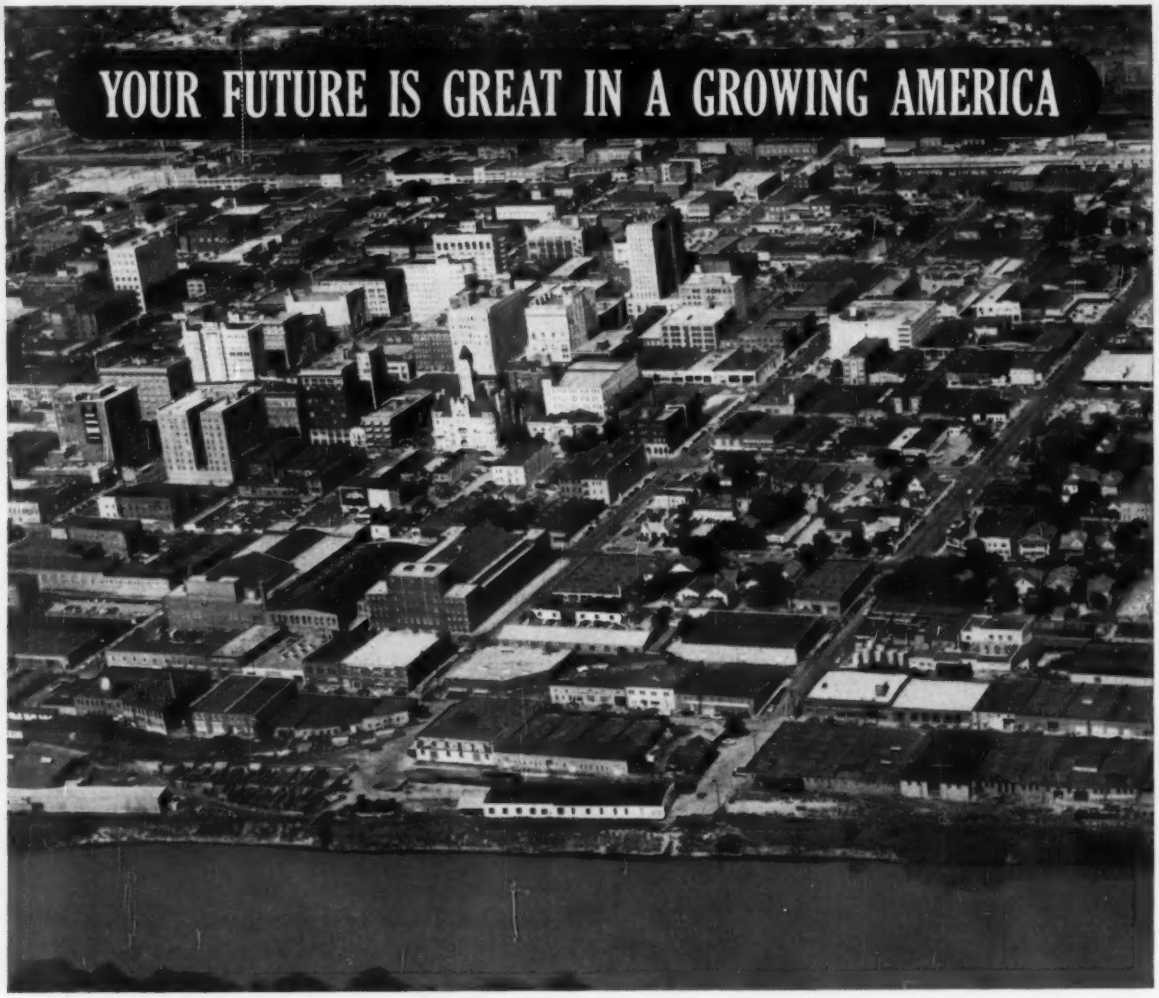

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3. **More income** . . . Family income after taxes is at an all-time high of $5300—is expected to pass $7000 by 1975.
4. **More production** . . . U. S. production *doubles* every 20 years. We will require millions more people to make, sell and distribute our products.
5. **More savings** . . . Individual savings are at highest level ever—*$340 billion*—a record amount available for spending.
6. **More research** . . . *$10 billion* spent each year will pay off in more jobs, better living, whole new industries.
7. **More needs** . . . In the next few years we will need *$500 billion* worth of schools, highways, homes, durable equipment. Meeting these needs will create new opportunities for everyone.

Add them up and you have the makings of another big upswing. Wise planners, builders and buyers will act *now* to get ready for it.

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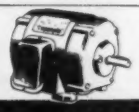

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Readers Forum

Who Wrote Transformer Story?

To the Editor:

The article appearing on page 63 of the March 17 issue of Electrical World, concerning the difficulties encountered by the Corps of Engineers with the English Electric Company transformers at Chief Joseph Dam, is certainly very interesting if not a little astounding.

Since the "article has been prepared by the Corps", I believe that the responsible individual in the Corps of Engineers, who prepared or authorized the article, should be given. If it is just an interview with a particular person in the Corp of Engineers, I also believe that the person being interviewed should be indicated. If the article has not been written by someone in your organization, certainly the person who did write it or who is responsible for it should be shown.

In my opinion it is rather inconsistent with adequate, sufficient experience in transformer design, and rather amazing that a piece of equipment would actually be designed, built and delivered to the customer with a condition that "effectively traps a quantity of oil at the top of the transformer that is never circulated".

Again, similar comments could be made on a transformer design that "had corona in varying amounts at normal operating voltages". To my mind, it is inconceivable that such a transformer could actually be built and delivered to the customer with this obvious design fault in it. This is especially true when testing, and detection apparatus is available which would certainly point up such a defect.

What is completely astounding to me is the reference to "negligible corona at operating voltage" after the design of the transformers was changed and the transformers returned to the Corps. Certainly it is a well established requirement that any corona at operating voltages in a transformer of this type is not to be tolerated. It has been possible for some time to build modern transformers which do not have corona in them, even under standard impulse test conditions. Therefore, I do not believe that it is in any way justifiable or adequate to designate corona as "negligible" at operating voltages. This is about as "negligible" as a hole in the head.

This situation of course, is of vital interest to the whole Electrical Industry in this country; and I believe because of this, and in the cause of good journalism, the responsible party for the preparation of this article should be indicated.

Charles T. Bradburn, P. E.
936 North Hawthorne Road
Cedarburg, Wisconsin

The Chief Joseph report was written by a high engineering supervisor of the Corps of Engineers who had followed closely the entire series of events. His name was deleted by higher authority while sanctioning his story as a Corps statement.—The Editor

Proceedings of the Electrical World's Right-of-Way Meeting held March 6-7 are now available. Price: $5 a set. Address R/W Editor, Electrical World, 330 W. 42nd St., N. Y. 36, N. Y.

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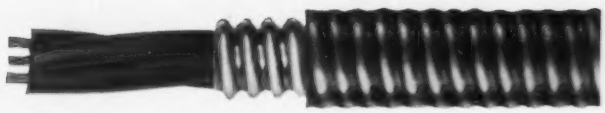

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